THE AMERICAN GAS LIGHT JOURNAL

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME XCI., No. 24. Whole No. 1,801. | NEW YORK, MONDAY, DECEMBER 13, 1909. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. H. WADELTON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

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[SPECIAL OFFICIAL NOTICE.]

Bureau of Information, American Gas Institute.

DETROIT CITY GAS COMPANY,
ENGINEERING DEPARTMENT,
DETROIT, MICH., Nov. 26th, 1909.

To the Members, American Gas Institute: Send questions to be submitted to the Bureau of Information for answer to V. F. Dewey, Chairman, Gas Office Building, Detroit, Mich. The Bureau of Information respectfully solicits your troubles. Yours respectfully,

V. F. DEWEY, Chairman.

BRIEFLY TOLD.

FINAL ANNOUNCEMENT RESPECTING THE GAS EXHIBITION.—The illustration herewith shows the interior of the Madison Square Garden, in which the exhibition of the National Commercial Gas Association will be held, the 14th to the 22d insts. This convention will bring together from all parts of the country men interested in the commercial side of the gas industry, men who are largely responsible for the immense growth in the output of gas, particularly during those hours in which the gas manufacturer is most vitally interested; that is, in what is known as the daylight sendout. Among them will be many of the pioneers in this line. In the 178 booths of the exhibitors (who represent points as remote and far apart as Toronto, Canada, and Los Angeles, Cal.) the variety of appliances shown will be practically unlimited as to the fuel field. Revolving bakers' ovens, capable of turning out batches of 225 loaves of bread at a charge, will be shown. The cooking appliances, running from the modest hot plate to the immense hotel outfits, such as may be seen at the Hotel Knickerbocker and other great New York city caravansaries; furnaces in which gas is used, which range from the jewelers' tiny forge to the immense melting pots for linotype machines, such as are used in the great newspaper offices, and gas engines, upon which our electric friends sometimes lean for energy, will be shown. All those niceties of heat control, which are so important in such work as blade coloring and tempering and colored enameling, will be exploited. The illumination of the building will be given over entirely to the gas man and his products. The latest creation in the way of gas light diffusion will be shown in the inverted gas arc lamp, and the intensity of the light will probably excel anything heretofore shown in indoor illumination. In fact, it is fair to say that it will approximate 4 or 5-candle power per square foot of floor area. The means of determining the illuminating power of gas will be shown through a display of photometers, and experts in the gas field will be in attendance to explain to the layman the methods of measuring gas and the proper diffusion of its light. Booths have been reserved in which object lessons will be given of the methods by which one of the largest gas companies in the world meets emergency calls in the case of leaks, breaks in mains and emergency fire calls, at which times the ever ready emergency crew take charge of shutting off the gas supply, looking to the preservation of life and property at extensive conflagrations. The concert hall of the Madison Square Garden will be used during the period of the convention by the members of this Association (which numbers about 600 and applications are now filed which will bring this number to approximately 1,000) as a meeting room during the sessions, where there will be read interesting papers upon the commercial side of the gas industry, by men qualified to specialize in the many branches of the business. Topics, such as educational advertising, promotion of sales through systematic canvassing campaigns, methods of promoting good will in communities supplied with so great an essential as gas by public utility corporations. The first two days of the exhibition will be given over to the Association and its guests. Practically every gas company within a radius of 100 miles of New York city has purchased admission tickets for distribution among the gas consumers of its district. The Public Service Corporation of New Jersey engaged a large floor space, and will have an adequate corps of men to look after the interests of our Jersey neighbors. The exhibition given in Chicago last year proved so attractive that, although it was given in one of the largest armory buildings in Chicago, it was found necessary on several occasions to close the doors, there being such a demand for admission. To avoid the congestion incident to the great demand for tickets by the public, it has been planned to issue a certain number of tickets for each day during the time that the exhibition is open to the public, which will be from Thursday, December 16, at 2 P.M., to 11 P.M., and each day thereafter, to and including the 21st of December, from 11 A.M. to 11 P.M. These tickets are printed in distinguishing colors. The responsibility of this tremendous undertaking has largely been thrown upon the shoulders of Mr. H. B. McLean, Chairman of the Exhibition Committee, and his assistants. The piping, an enormous undertaking in itself, was planned and carried out under the direction of Mr. Wm. De Freitas, Mr. McLean's capable lieutenant. The color scheme of the decorations in the vast auditorium is to be pink and white, and, with the chandeliers, which have been specially designed for this occasion, a very beautiful effect is promised. The entertainment programming includes a dinner at the Hotel Astor, directed by President Shattuck, which promises to be a splendid function. This is in honor of the speakers who are to address the general assemblage of members and guests at the concert hall later in the evening. Other entertainment features of the convention are in the hands of Mr. Clark, and as the programme was all well planned in advance, it will certainly be brought to a satisfactory conclusion. Among the set functions are luncheons for the attending ladies at the Hotel Astor, taxicab rides, concert, Hippodrome party and a swell after-theater supper at the Hotel Astor. Mr. Clark has called in to assist, as co-committeemen at these functions, Mrs. J. E. Shattuck, Mrs. H. B. McLean, Mrs. L. S. Bigelow and Mrs.

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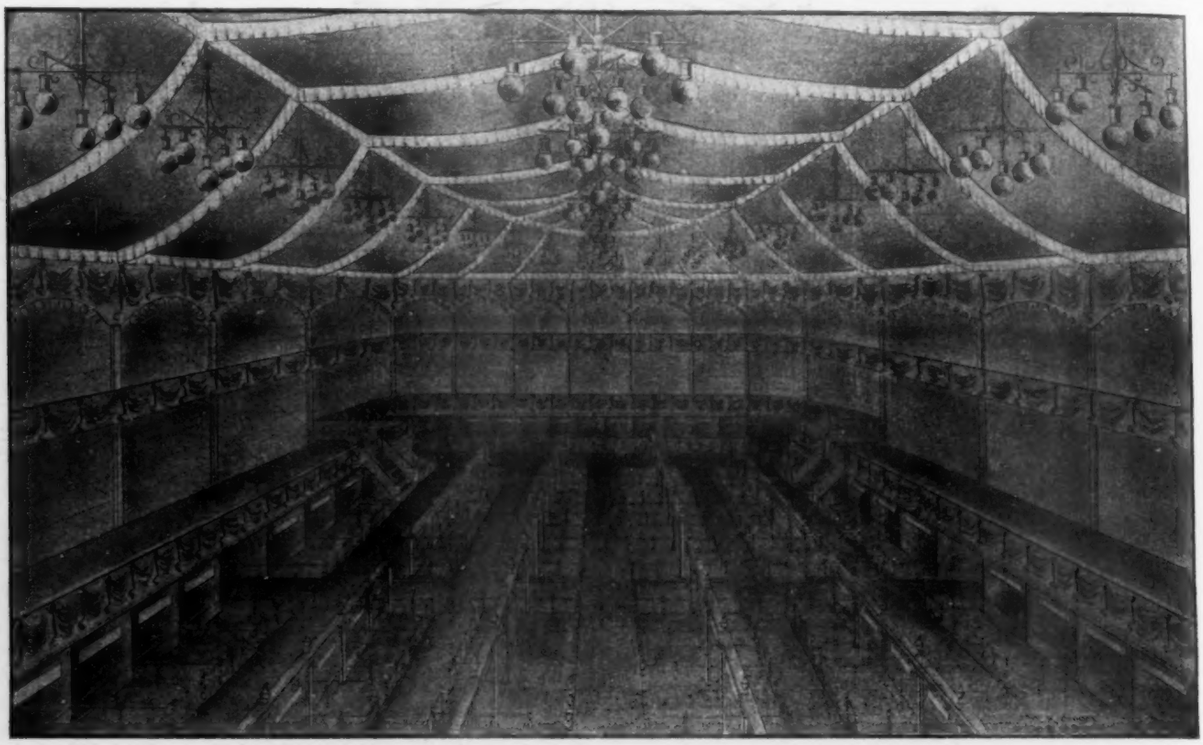
SMITHSONIAN DEPOSIT



Clark. The spaces in the Garden are practically all sold and the financial success of the exhibition is assured. No doubt the convention will prove a great stimulus to all those connected with the gas industry, as upon the commercial factor, for which the N. C. G. A. stands, depends largely the vital point to the gas producing end of the industry—*i. e.*, cost per 1,000.

ANNUAL REPORT (1908), DEPARTMENT OF WATER SUPPLY, GAS AND ELECTRICITY, NEW YORK CITY.—The annual report of the extensive operations of this department has been presented by Commissioner John H. O'Brien, at a much earlier date than is usual with that publication. The figures covering the water division are given in such a complex manner that data covering the whole city is not readily available. The Bureau of Lamps and Lighting presided over by Chief Engineer C. F. Lacombe, gives considerable data which should be of interest. This department covers the installation and maintenance of the public lighting of streets and public buildings, the testing of gas supply and the inspection of electrical equipments, in private as well as public buildings. The money involved reached upwards of 4 millions dollars as will be seen from the totals given in Table I.

The results of the tests of gas supply made by Dr. E. G. Love, taking the averages for the year 1908, appear in Table II.

Some idea of the magnitude of the public lighting operations may be had from the summary of lamps in use at the end of each year since 1907, as given in the report of General Inspector W. G. Quirk, shown in Table III.

During 1908 there were 4,478 new lamps lighted, 3,880 lamps relighted, and 6,497 lamps discontinued. Over 6,000 gas lamp posts were repaired. There were over 100,000 outages of all kinds of lamps, the totals being given in Table IV.

There are nearly 4,000 miles of highways in the Greater City, and there were 3,401 miles of gas mains in use at the end of the year, as shown in Table V.

For those who are interested in the development of this feature of

TABLE I.—*Showing Expenditures of Bureau of Lamp Lighting.*

Appropriations.	Manhattan and The Bronx.	Brooklyn.	Queens.	Richmond.	Total.
Street and park lighting	$1,246,821.65	$1,013,234.84	$352,618.06	$171,039.47	$2,783,764.02
Lighting public building	498,109.80	161,550.96	28,958.21	20,518.28	709,137.25
Heat and power	46,573.37	17,677.32	2,082.83	867.15	67,200.67
Bureau expenses	18,718.82	4,089.01	4,959.32	1,974.98	29,742.13
Salaries	88,262.28	26,629.16	11,245.20	7,999.98	134,136.62
High pressure fire service	62,887.54	41,084.55	.....	.....	103,972.09
Testing electric meters	1,500.00	.....	.....	.....	1,500.00
Total appropriations	$1,962,873.46	$1,264,315.84	$399,863.62	$202,399.86	$3,829,452.78
Revenue bond fund	2,587.24	.....	.....	.....	2,587.24
Total	$1,965,460.70	$1,264,315.84	$399,863.62	$202,399.86	$3,832,040.02

TABLE II.—*Showing Averages for* 1908 *of Gas Tests.*

Gas Company.	Specific Gravity.	Grains in 100 Cu. Ft. Sulphur.	Ammonia.	Pressure, Ins. Maximum.	Minimum
Consolidated Branch, No. 1	.680	6.83	.02	2.41	1.93
Consolidated Branch, No. 2	.678	6.55	...	2.26	1.81
Consolidated Branch, No. 3	.615	6.40	.01	2.20	1.97
Consolidated Branch, No. 4	.620	14.13	.08	2.66	2.32
Consolidated Branch No. 6	.637	12.04	...	2.40	1.93
New York Mutual	.676	7.21	...	2.45	2.17
New Amsterdam	.585	15.31	...	2.59	2.05
Standard	.589	17.32	...	2.62	2.01
Brooklyn Union, Williamsburg	.656	3.55	.14	3.64	2.01
Brooklyn Union, Nassau	.657	3.18	.33	3.79	2.06
Brooklyn Union, Fulton	.674	5 13	.08	2.84	2.11
Brooklyn Union, Citizens	.672	4.76	.04	3.56	1.82
Brooklyn Union, Metropolitan	.710	5.69	.31	3.49	1.72
New York and Richmond	.646	6.02	.13	3.98	1.76
Kings County Lighting	.640	6.91	.47	5.52	1.59
Queens Borough Gas and Electric	.659	....	...	3.82	2.28
New York and Queens	.631	....	...	3.91	2.28
Central Union	.616	....	..	2.18	1.90
Bronx Gas and Electric	.662	....	...	2.40	1.47
Brooklyn Borough	.611	....	...	5.18	2.52

TABLE III.—*Showing Public Lamps in Use Since* 1901.

End of Year.	Electric. Arc.	Electric. Incandescent.	Gas.	Naphtha.	Total.	Population.	Candle Power.
1901	11,991	4,076	41,381	4,222	61,670	3,609,386	6,764,612
1902	12,431	4,170	41,804	4,198	62,603	3,723,044	7,052,750
1903	12,522	4,674	43,098	4,158	64,452	3,841,711	7,102,356
1904	12,739	4,684	43,009	4,217	64,649	3,962,371	8,061,852
1905	13,391	4,248	43,067	4,263	64,969	4,088,275	8,542,590
1906	14,218	4,588	42,430	4,273	65,509	4,218,577	9,702,056
1907	14,765	4,745	43,636	4,352	67,498	4,353,464	10,950,871
1908	15,441	6,532	44,057	3,336	69,366	4,493,118	11,428,020

TABLE IV.—*Showing Lamp Outages.*

Greater New York.	Electric. Arc.	Electric. Incandescent.	Gas. Mantle.	Gas. Open Flame.	Naphtha. Mantle.	Total.
Inspectors	10,103	5,269	29,271	79	14,543	59,265
Police	19,531	2,388	18,209	2*	6,201	46,331
Companies	3,686	82	....	..	....	3,768
Total reported	33,320	7,739	47,480	81	20,744	109,364
Duplicates	2,152	136	2,354	..	1,999	6,641
Total deducted	31,168	7,603	45 126	81	18,745	102,72 3

TABLE V.—*Showing Length of Mains in Use by the Various Gas Companies in the Greater City During the Year* 1908.

Borough and Company.	In use January 1, 1908.		New Mains Laid.		Mains Disused.		Mains Taken Up.		In use December 31, 1908.	
Greater City.	Miles.	Feet.	Miles.	Feet.	Miles.	Feet.	Miles.	Feet.	Miles.	Feet.
Manhattan	1,407	4,786	8	2,644	6	1,171	4	4,666	1,405	1,593
The Bronx	349	1,072	12	4,770	1	3,843	1	1,868	359	131
Brooklyn	1,126	4,364	26	1,924	2	3,330	3	2,321	1,147	637
Queens	382	4,537	26	952	.	1,612	2	4,530	405	4,617
Richmond	81	4,382	1	4,945	.	....	.	....	83	4,047
Grand total	3,348	3,301	75	4,665	10	4,676	12	2,825	3,401	465

lighting we refer to the historical data given in our Semi-Centennial, special number, published last July.

Appliances and Their Application.

[Communicated by MR. PAUL CHALLIS.]

If time is money there still remains an immense amount of it to be saved, for the use of proper tools and appliances makes for expedition and economy almost as much as the proper man on the job; and much is lost daily through the lack of both. Any kind of a workman will save time in his work by having the right kind of tools and supplies at hand, ready for immediate use. This is easily illustrated in the service work done by the majority of gas companies, more especially the smaller ones. Where primitive methods are used, the men start from the shop or plant, with picks and shovels, consuming the time necessary to reach the job, be it a block or a mile. The necessary pipe, with some fittings and additional tools, follow in an express wagon. At night the tools are stored on the job, in the ditch, or back of the house, or in any convenient place which the foreman thinks will best keep them until next day, and if none are missing in the morning it is due more to good luck than otherwise. When the job is finished and a move made to the next one, a wagon is supposed to pick up left-over pipe and fittings. As it is not likely that these things are checked, where such methods are followed, the amount of loss cannot be accurately traced.

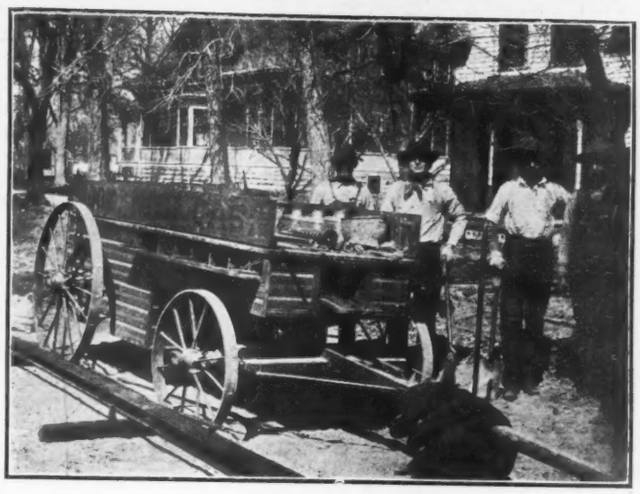
A slight improvement is noticed when a tool box is provided in which to lock the tools at night. This varies in style, as much as women's hats, and runs, from a box similar to a carpenters' tool chest to an organ box. When full of tools these are cumbersome and hard to handle, and often must be unloaded in order to be loaded into a wagon. The contents are generally a jumble of picks, shovels, wrenches, lanterns, fittings, junk and waste, with the thing wanted first always on the bottom, requiring a constant overhauling of the contents to get the article desired. Generally everything is soaked with oil from the overturned oil cans or broken lanterns.

The evolution this tool box passes through, in the march of progress, equips it with a pair of cast-off wheels, and a more or less decrepit tongue. To this is added a pipe vise, fastened to the lid. The pipe, tools and fittings, when in use, are stored on the ground, as the lid of the cart is generally put on at an angle of ¼ pitch to the body, to shed the most of the rain, and must be opened quite frequently in order to dive in for some needed article. Cutting a heavy thread on pipe, if it is not sent to the shop for the purpose, can be accomplished by running a pole or piece of heavy pipe through the wheels, with a man on each end, to prevent the cart overturning, providing the lid of the box is not torn off in the operation.

A short study of the conditions met with in service work is sufficient to demonstrate that the best is the cheapest, and several years' use of service wagons, as illustrated under varying conditions, has proven them at all times a most profitable investment. This wagon is a veritable shop on wheels. The wheels and axles are steel, of suitable strength to carry all the loads of pipe and supplies that are ever needed to be moved. The top is covered with a single piece of galvanized iron, making it absolutely water tight. Very few nails are used in the construction, the assembling being done with bolts and screws where possible, and iron bands placed to insure the most rigid construction. With fair usage such an appliance is good for 100 years. One padlock on the rear locks all doors. All sides, and side-boards are lettered with gas advertising, and this feature alone is better than scores of advertising schemes in use, as the wagon is a familiar object on the street, being constantly before the public. Only when it may be hauled in during the winter does this live "ad." disappear from daily public gaze.

The pipe vise is bolted to a heavy plank, which is rigidly built into the top, and heavy pipe threads are cut with ease. The rear end of the body has a compartment capable of holding enough tools for 20 men, others for lanterns and oil cans, wrenches and small tools, die stocks, long bars, etc., with a special place for a level. The front end is divided on each side into 7 bins, in which any needed variety of fittings may be carried, as well as a slide holding a spring clip containing orders and records. When loaded with all the tools and fittings ordinarily carried, the weight is about 2,200 pounds, yet two men handle it easily on a level, paved or graveled street.

In practice the wagon is hooked behind an express wagon and moved to the point wanted, at the same cost to move the smallest tool box, and is equipped with all necessary supplies to do the job or jobs complete. If there is an accumulation of service orders in one locality, by planning to start the work at the highest point on the street, the men easily move the wagon down grade and complete several jobs before it is necessary to again have the wagon hauled to another high point. If the jobs are scattering, and but 3 or 4 men are used, a line of house fittings can be carried and house piping and stove connections can be made simultaneously with the installation of the service. The wagon is equally useful in main work, and is moved along the street as the main is laid, by the men employed, without the use of outside help.



The Wagon on the Job.

The first cost of improved methods, which involve the investment in an appliance of this kind, deters many from taking advantage of such, yet the saving of only 10 minutes' time of one laborer each day will pay the interest on this equipment, while the actual saving over ordinary methods will pay for the outfit in one busy season. With it there is no necessity for the gang to sit on the bank of an open ditch, while the foreman goes to the shop, at a greater or less distance, to get a plug or tee, or cut a piece of pipe, etc. The foreman keeps track of his supply of material, and, when short, has his stock replenished from the shop when a wagon is engaged to move him. Nothing is left behind to be picked up or lost, as the case may be, and when left at night all tools and fittings are secure.

[CONTINUED FROM PAGE 1250.]

REPORT OF PROCEEDINGS, FOURTH ANNUAL MEETING, AMERICAN GAS INSTITUTE.

HELD IN THE HALL OF ELKS, DETROIT, MICH., OCTOBER 20, 21 AND 22, 1909.

FIRST DAY—MORNING SESSION.

REPORT OF COMMITTEE ON ELECTROLYSIS.—*Continued.*

Summary and Conclusions.—The statement that a given piping system is not suffering from electrolysis cannot always be taken as evidence that the system is actually free from stray currents and is immune from electrolysis, and especially not when reference is made

to cast iron mains carrying gas at ordinary pressures. The effect of electrolytic corrosion of cast iron is to oxidize the iron, leaving the iron oxide and the graphitic carbon in place whereby the form of the pipe is kept intact. I have seen cast iron pipe, apparently in good condition and carrying gas without leakage, which, upon being tested with a hammer, was found to be pitted entirely through the iron in more than one place. I have seen such cases where the blow of a hammer caused a plug as large as a silver dollar, of this graphitic remains from electrolysis, to drop out exposing a hole through the pipe. Some of the replies report that there is no trouble from electrolysis, and where no proper examination has been made, therefore, do not afford conclusive evidence of immunity from electrolysis.

Cement joints as ordinarily made do not generally produce metallic electrical connection between the two pipes, and such joints may practically be classed with insulating joints. A pipe line laid with all cement joints, or with insulating joints, is therefore a discontinuous electrical conductor, and is not capable of carrying stray electric currents. Such a pipe line cannot, therefore, pick up current in an extensive negative area to discharge it in a restricted positive area, which is generally the cause of the most serious electrolytic danger. For this reason a piping system with all cement or insulating joints is on the whole much less likely to be affected by electrolysis than a piping system with all lead joints or with screw couplings. Experience has shown, however, that a cement jointed piping system is by no means immune from electrolysis, and we have abundant reports which show that cement jointed mains, and especially service pipes from such mains, can suffer severely from electrolysis. In these cases the stray currents reach the mains and service pipes from other pipes or by other paths. Where the current which reaches a service pipe connected to a cement jointed main can be definitely traced as coming from house services, it is possible to stop this flow of current by introducing an insulating coupling in the service pipe inside of the building or in the riser connecting to this service pipe. It is also conceivable that a pipe may lie in ground in the path of earth currents of sufficient density to produce electrolytic action upon the pipes. Such a high density of earth currents may exist in the immediate vicinity of electric railway power stations having a poorly constructed return circuit. A reasonably good construction of the return circuit of the railroad should, however, prevent the existence of any such dangerous current density in the ground, as such current would be clearly a source of very great danger to all underground metal lying in its path, including steel building foundations.

The question of whether a pipe line can be protected from electrolysis, by installing a limited number of scattered cement or insulating joints, depends entirely upon local conditions. There are undoubtedly cases where the installation of even a few insulating joints at proper places will greatly reduce if not eliminate electrolytic danger. Experience has shown, however, that a few individual insulating joints may do more harm than good, and they can only be applied in special cases, and then only at points where electrical tests have indicated that they will do good.

As to the cause of the high resistance of cement joints, this is probably due to the fact that, although in laying cast iron pipe every attempt is made to push the spigot end home into the bell, as a matter of fact, in most cases the two pipes are not in metallic contact. Even where there is metallic contact this is probably over a comparatively small area, if not at a point; as the end of the spigot is always heavily coated with scale, such metallic contact generally forms a poor electrical contact of comparatively high electrical resistance. It is a simple matter to positively prevent metallic contact by inserting a ring of some cheap insulating material, such as fiber or cardboard, between the end of the spigot and the interior of the bell, and this has been done in some cases. The resistance of cement joints is then the electrical resistance of the cement intervening between the spigot and bell, and while cement is not an insulator, but on the contrary is probably as good a conductor as ordinary ground, yet, compared with iron, the resistance is so high that the cement joints practically interrupt the electrical continuity of the pipe line.

In the case of lead joints, I have had occasion to measure the resistance of several hundred joints in use on various sizes of pipes. These joints generally have a comparatively low resistance, being equivalent as a rule to the resistance of 10 or 20 feet of continuous pipe. Occasionally, however, I have found lead joints which have resistances equal almost to 1 ohm and equivalent to over 10,000 feet of continuous pipe. I have made special tests in the laboratory of Stevens Institute upon 2 cast lead joints, and upon 2 lead wool joints made on 8-inch cast iron pipe. These joints were made in every respect as they are made in practice and without taking any special precautions, and the resistance tests were made a couple of months after the joints had been calked. The resistances found were as follows: 0.0002 ohm for the first cast lead joint, 0.00006 ohm for the second cast lead joint, and 0.00003 ohm for each of the 2 lead-wool joints. The resistance of the lead-wool joints appears, therefore, to be about half of that of the lowest resistance cast lead joint. The resistance of a lead joint is almost entirely that of the surface contact between the lead and the iron. The lower resistance of the lead-wool joint is, therefore, probably due to the fact that the lead of the joint makes contact with the iron over a greater area than in the case of the cast lead joint. Since the resistance of a lead joint is that due to the surface contact it is clear that such joints are likely to increase in resistance with age, and this appears borne out in practice. I remember testing one lead joint in a very old pipe, which gave a value of about 0.4 ohm. By standing on one of the pipes the resistance was reduced to one-tenth of its former value, due probably to the fact that, under the strain, better surface contact was made between the lead and the iron.

Where a cast iron lead jointed main has been in the ground for a great many years, it is probable that many of the joints have reached such high resistance values as to effectively break up the electrical continuity of the pipe. I have also found that very old pipe, especially early pipe that was imported from Scotland, is coated with a surface scale or oxide which has such a high surface resistance as to be practically an insulating covering. I have found cases where it was necessary to apply chisel and hammer to cut through a thick and very hard coating before electrical contact to the iron could be made. Where such old pipes were in the gronnd before electric traction was started they are very much less subject to trouble from electrolysis than new pipe, affected immediately by stray current, the effect of the electrolysis being to produce a condition around the pipe which aids corrosion and prevents the formation of a self-protecting insulating covering.

In regard to the use of insulating pipe coverings, experience shows that imbedding a pipe in cement or concrete, even if this is several inches in thickness, does not protect the pipe from electrolysis, and in some cases it has even been found that the pipe in concrete is destroyed at least as rapidly as when it is buried in ground.

As to the use of paints or dips for protecting pipes, the first difficulty is the mechanical one of applying the paint so as to form an absolutely perfect coating, and then to prevent mechanical damage to the coating. Where imperfections exist or develop, aggravated trouble always ensues. Experience further seems to show that even where paints or dips are apparently intact and perfect, electrolytic action is not prevented, and in fact very serious electrolytic pittings have been found under apparently good coatings.

The only kind of insulating covering which appears to afford certain protection is a layer of a least 1 or 2 inches of a material like coal tar pitch or asphaltum, of such a grade that it is not brittle and so will not crack, but yet is hard enough to remain in place. The best way to apply such layer is to surround the pipe with a wooden box, support the pipe upon creosoted blocks of wood or upon blocks of glass, and then fill the space between the box and pipe with the molten material. As a further protection, an insulated coupling should be introduced at each end of the section covered, so that, even if the covering should become defective at any point or points, no current can reach these points to corrode them by electrolysis. A pipe treated in this way, with the work done so as to be mechanically perfect would, undoubtedly, be protected from electrolysis. However, the cost of carrying out such an installation is absolutely prohibitive, except in a few cases, such as in the case of service pipes in very bad localities or in the case of some very important individual pipe lines of small size. It is not sufficient to apply the covering only in the positive district, nor, on the other hand, is it always necessary to cover the entire length of line. The portions which must be insulated can only be determined by properly conducted electrical tests.

Regarding the use and value of an electrolysis survey, it must be remembered that the object of the survey is to indicate the existence or non-existence of stray electric currents upon a piping system and to determine where such currents flow on to the pipes and from the pipes. I have had occasion to examine a large number of electrolysis surveys, some of which were kindly loaned to me by members in reply to my question blank. Most of these surveys consist, however, exclusively of voltmeter readings. Such readings by themselves do not afford a measure of electrolytic danger; they merely indicate where the greatest danger is likely to exist. Measurements of current flow on pipes are essential in an electrolysis survey because all

current which flows on a pipe must leave it, and the amount of damage produced is proportional to the total current which leaves the pipe. I have seen some reports, on the other hand, where it is stated that the current on a given pipe is zero, but where the instruments and methods employed were not sufficiently sensitive to detect currents as large as 2 or 3 amperes, and where, therefore, the conclusion of zero current is not warranted. From a complete and properly analyzed electrolysis survey, a great deal of good can generally be accomplished. It will not always be possible to remove all stray currents from the pipes, but measures will be indicated by which the conditions can be greatly improved, and points of greatest danger will be located. If, then, trouble does occur at a later time at these points, the electrolysis survey may be most valuable in affording proof of the destruction of the property from railway currents and may be the means of compelling the railroad company not only to pay for the damage but also to make improvements in its return system so as to avoid the recurrence of such damage. I know of a number of electric railroad companies who are regularly paying for damage caused by electrolysis to piping systems. The knowledge that a pipe-owning company is making electrolysis tests, and is keeping watch on the situation, also has a strong moral effect on the electric railroads.

In conclusion, I wish to say that I have no doubt some of the members will be disappointed in my paper because I have not been able to present a simple cure-all for electrolysis. I am afraid that the only possible cure-all is an insulated railway return system. I am convinced, however, that in nearly every case where serious stray railway currents flow on piping systems a very great reduction of these currents can be accomplished by improvements in the return circuit of the railways, and in many cases these stray currents can be reduced to a small fraction of their former amount, and this should in every case be the first step. After this has been done there are many cases where insulating methods judiciously applied to the piping system will further greatly reduce the stray currents which still remain.

I wish to take this opportunity to thank the members of the Institute who were good enough to furnish me with data and information for this paper.

APPENDIX.

Extracts Quoting Experience with Cement Joints.

Reply No. 3.—Practically all joints were made of cement until about 1882. For several years the rule has been two cement joints to one lead joint. The mains extend parallel to trolley tracks and close to power houses. Most of the trouble has been local to power houses. In the worst cases the pipes were badly pitted. The plumbago condition is more widespread than the pitting.

Reply No. 8.—Practically all the mains are cast iron with cement joints. Trolley tracks in most cases are within 10 feet of mains. Power house is 200 feet from nearest main. No electrolysis tests have been made, but mains are examined for electrolysis each time they are uncovered. There has been considerable trouble from electrolysis of service pipes, the trouble being throughout city on streets having trolley lines.

Reply No. 10.—Two miles of cement jointed mains with every fifth joint lead have been in service 5 years. Mains lie directly under trolley tracks. Power house is 5 miles away. So far there has been no apparent trouble with mains, but trouble with service pipes.

Reply No. 12.—Practically all suburban mains have been laid with cement joints for about 5 years. Many of the pipe lines are parallel to trolley tracks, and some are near substations. Accurate tests show that no current flows along the lines of the mains. There has been one case of electrolytic action on cement jointed main at a point close to the power house. There has been trouble from electrolysis of service pipes, principally in the vicinity of railroad sub-stations. The mains are generally bonded to the negative returns of the neighboring power houses or sub-stations. Tests show that the bond connections from cement jointed mains do not return any measurable current.

Reply No. 13.—1,500 feet of 6-inch, cast iron mains were laid with cement joints 11 years ago. Main lies near power house, and services have been eaten out in the past. The mains were covered some 2 years ago by a stone and cement paving, and at this time nearly all of the services were renewed and boxed in tar or pitch. The tracks were also put in the best of condition. Tests fail to show any currents wandering from water pipes through house piping and back to the gas services.

Reply No. 14.—Many miles of cast iron mains with cement joints have been laid since 1900 in all parts of the city near power houses, crossing trolley lines and paralleling them. So far no corrosion of these mains has been found, but some little evidence of electrolysis upon services connected to these mains has been found.

Reply No. 16.—All street mains have been laid with cement joints, and no special care has been taken to prevent metallic contact between the sections, though apparently the cement joints do break up the conductivity of the pipe, as in some cases there is evidence of current jumping around a cement joint. The ordinary distance between joints is 12 feet, and there are lines along the sides, crossing and entirely away from the trolley tracks. There has been trouble with corrosion, pitting and complete destruction of the structure of the cast iron in pipes along the side of trolley lines. In all cases, however, it was found that the current apparently was flowing from the rails to the pipe and from the pipe to other structures. The most serious trouble was found on one street, which is a trunk line of railway.

Reply No. 18.—500 feet of cement jointed, cast iron main has been 8 years in service and parallels trolley tracks 5 feet distant. Pipes were shoved home when being laid. There is no power house nearby. No tests have been made and no trouble from electrolysis has been found.

Reply No. 19.—Practically entire system consisting of about 100 miles consists of cast iron pipes laid with all cement joints. Pipes were shoved home when being laid. Some of the lines have been in service for over 40 years. Some lines are in same street with and close to trolley lines and to power house. No evidence of corrosion has been found, except in one place and that within a few blocks of power house, but pitting at this point was not serious.

Reply No. 20.—Forty-six miles of cement jointed, cast iron mains have been in use from 1 to 50 years. The pipes are nearly always in metallic contact inside the joints. Trolley tracks parallel with pipe in many streets and power house is within 30 feet of one of the mains. No tests have been made and no corrosion or pitting has been noticed.

Reply Mo. 22.—We commenced laying cement joints in about 1895, and mains are now laid with all cement joints in which the pipes are in metallic contact. There has been no trouble from corrosion or pitting in metallic mains, but a few cases of electrolysis in services have been found.

Reply No. 23.—Cement joints are used on some of the lines, but no attempt was made in laying them to make them insulating. In one case about 2,500 feet of 8-inch main with cement joints lie on an average within 3 feet of trolley rails. Power house is 2 miles away. This line has been in service 15 years and shows signs of pittings near the joints at a number of points. Tests show some flow of current all along the lines for at least 2 miles from power house, and considerable damage has been found.

Reply No. 24.—A 6-inch main laid in 9-foot lengths, all cement joints, was abandoned, after having been in use for 30 years. This main laid in the central part of a large city and under trolley tracks. Wherever this pipe was exposed, or it paid to take it out, it was found in perfect condition.

Reply No. 25.—All mains are laid with cement joints and these have been in use from 1 to 30 years. Electrolytic destruction of service pipes has been found. Tests show that current flows on the service pipes from water mains through water service connections. Trouble was stopped by introducing insulating joints in these service pipes, and also by covering each service pipe by a discarded larger cast iron pipe metallically connected to the service pipe.

Reply No. 27.—All cast iron mains are laid with cement joints and are in metallic contact inside of joints. Trolley tracks are on a great many streets distant 2 to 10 feet from pipes. There has been some trouble with supply pipes near power house, but no tests have been made.

Reply No. 30.—Some lines with cement joints have been in use for 25 years or more. The pipes were apparently laid without any thought as to metallic contact inside of the joints. No tests have been made and no apparent trouble form electrolysis has been found.

Reply No. 31.—One and one-half miles of cement jointed, cast iron pipe have been in service 6½ years. The pipes are supposed to be in metallic contact. About ¼ mile of pipe line is from 3 to 5 feet from trolley tracks; end of line is about ¾ mile from trolley power house. No tests have been made and no trouble from electrolysis has been noticed.

Reply No. 34.—Nearly all pipes have been laid with cement joints since the works were started in 1853. Spigot end is driven home. A very thorough electrical survey of the conditions of the pipes has been made in unison with the city water system and the electric car system. The results of the survey are that the pipes were practically free from electrolysis. Some trouble was developed in the city water system.

Reply No. 35.—Cement jointed mains are in use and the pipes are in metallic contact inside of the joints. Trolley tracks are on streets with pipes and about 4 feet from pipes; power house is on same street. Some shallow pittings have been found in front of car barns and power house. There has been considerable trouble from destruction by electrolysis of the wrought iron service pipes. No remedy has been found to stop this.

Reply No. 36.—Practically all mains are laid with cement joints, driven home in sockets as far as possible before cementing, thereby making iron to iron contact. One mile parallels trolley tracks. No tests have been made and no trouble from electrolysis has been found.

Reply No. 38.—One-quarter mile of cast iron, cement jointed mains has been in service 4 years. Pipes are in metallic contact. Trolley tracks are within 8 feet and power house is 4,000 feet away. No tests have been made and no trouble from electrolysis has been found.

Reply No. 39.—Several cast iron pipe lines are laid with cement

joints. Joints are so made as to form a metallic contact through joints. One and one-half miles of 16-inch pipe have been in service 47 years. Trolley line has operated on this street for past 3 years. Location of nearest trolley power house is about 1 mile distant. This main carries very little current and lies in a negative district in regard to the electric car system. There has been no apparent trouble from corrosion or pitting on main. There has been trouble with service being eaten out. Trouble caused by poor construction of electric lighting system, and this trouble was localized in a district about 4 blocks long. Trouble does not seem to have any relation to trolley power house district. The trouble disappeared when the electric lighting company repaired its line.

Reply No. 40.—Cement jointed mains are in use. Pipe line parallels and frequently crosses under trolley tracks. No pitting of cast iron pipe has been found. Wrought iron pipes are badly pitted in some localities, where street railway bonding was in bad shape. Trouble noticed more particularly in the immediate vicinity of street railway tracks. No tests have been made.

Reply No. 41.—We have 1,200 feet of cast iron mains laid with cement joints with metallic contact inside of joints. Every 5th joint in lead and mains have been in service 25 years. Mains are inside of loop where trolley cars are constantly passing and are not near power house. There has been some trouble from electrolysis at one point where the mains come close to the surface directly under the rails. No tests have been made.

Reply No. 43.—About 310 miles of cast iron mains, with cement joints ranging in size from 3 inches to 12 inches, have been in servtce from 1 to 50 years. Mains are laid with all Roman cement joints. Mains are in all streets where there are trolley tracks about 6 feet distant. Mains also cross under trolley tracks. During the last 6 years about 25 services have been corroded by electrolysis. It is believed that in some cases this current was conveyed from the water service pipes, to the gas service pipes, also in some cases from telephone and electric ducts to gas services rather than from the gas mains. Most trouble was found near switches and joints of rails. Pipes were usually affected directly under rails and about 2 feet on either side of rails.

Reply No. 44.—62 miles of mains, cement joints, laid with pipes iron to iron have been in service from 1 to 6 years. Mains parallel tracks at an average distance of 6 feet and frequently cross the tracks. Power house is from 1 to 9 miles from gas mains. There has been no trouble from electrolysis.

Reply No. 45.—Sixty miles of cast iron mains are laid with all cement joints. In most cases they are made in such a way as to have a metallic contact inside of the joints. Some tests made show that maihs are carrying very small stray current. No trouble from electrolysis has been experienced.

Reply No. 48.—About 40 per cent. of the cement jointed gas mains are in streets parallel with and quite close to trolley tracks, and a small portion of them is near the trolley power house. All joints are supposed to have metallic contact inside by being put home before joint is made. Pipe lines near trolley power house were found to be carrying stray current, but thus far no damage from these mains has been discovered. Trouble with electrolytic corrosion of services in the vicinity of the power house, and also near the local car barn, has been experienced. Services have been destroyed where they cross over bare return wires lying in the ground near the trolley power house.

Reply No. 49.—We have several miles of cement jointed mains not made in metallic contact mostly away from trolley tracks; probably 2 miles of mains are in streets with trolley tracks. Some traces of electrolysis on mains have been found. Tests have shown trouble to have been caused by poor bonding of trolley road, and when this bonding was repaired the trouble ceased.

Reply No. 50.—Two miles of cement jointed cast iron mains have been in service 10 years. Mains lie 8 feet from trolley tracks and trolley power house is several miles away. There has been no trouble from electrolysis of mains but trouble from electrolysis of services. No tests have been made.

Reply No. 42.—All mains consisting of a great many miles are laid with cement joints and have been in use for a great many years. Pipes are probably not in metallic contact in most cases. Tests show that these mains do not carry any current. There has been no trouble from electrolysis of mains, but two or three scattered services have been destroyed by electrolysis.

Reply No. 51.—All mains are laid with cement joints and have been in service from 1 to 40 years. Pipe line parallels trolley tracks and passes by power house on same side of street. One service close to car track was found corroded.

Reply No. 52.—About 426 miles of cement jointed mains are in use with pipes in metallic contact; 250 miles are made with all cement joints. The general use of cement started in 1900. Several lines of trolley roads parallel and cross pipe lines with proper houses at different points. No tests have been made and only one case of trouble from electrolysis of a lead pipe near power has been reported.

Reply No. 54.—About 140 miles of cast iron mains are laid with cement joints. Some mains pass within 5 feet of power house. Tests show very slight current on mains. There has been no trouble from electrolysis.

Reply No. 137.—Cement joints are used entirely and trouble from electrolysis was experienced on service pipes, particularly where these crossed a line of track where there was heavy traffic. It does not seem that the service pipes carry current to the mains, but they rather serve as a sort of cross conductor under the several tracks and gather current from the imperfectly bonded rails, which convey to water pipes and damp ground in the vicinity of the sewers and elsewhere. In these cases, particularly in the crowded squares, the services have been covered from the mains to the sidewalk with drain pipes, placing small blocks of wood in the pipes, so that the service pipes are practically in air space. This appears to have remedied the trouble.

Reply No. 138.—The mains are laid with all cement joints, and the damage from electrolysis to the cast iron mains has not been anywhere near as great as the damage to the wrought iron and steel service pipes. Outside of the cement joints no provision is made to prevent electrolysis on cast iron mains. Occasionally a pipe is very badly eaten out, but as a rule these places are few and far between and the location is usually known.

Extracts Quoting Experience with Insulating Joints.

Reply No. 1.—Five lines of 7-inch and 6-inch wrought iron pipes, each approximately 1 mile long, are in use. The pipes reach a dock at one end and cross under trolley tracks near the other end. Three sets consisting each of 5 special insulated flanged joints (home made) have been inserted in each one of the lines, one set at the dock end, one at the trolley end, and one midway between. Before the insulating joints were installed, these pipes were found to carry from 200 to 300 amperes, the current coming in from the water front, and being delivered to the trolley tracks to which the pipes were 10 volts positive. Corrosion was found on pipes where they crossed under trolley tracks, but the principal trouble was dangerous sparks at both ends of the lines. The installation of the insulated joints is stated to have obviated this trouble.

Reply No. 2.—Nine miles of 2-inch wrought iron mains, with Dresser insulating sleeves, 300 feet apart, pass under and parallel trolley tracks and have been 2 years in service. An electrolytic survey has been made and no trace of electrolysis has been found. There is small leakage from street car lines, but not sufficient to cause damage at present.

Reply No. 5.—About 4½ years ago a 4-inch, high pressure, wrought iron gas main was laid, which ran immediately under a single trolley track line which was on the near side of the road. The gas main went to the other side and by proper bends paralleled the trolley track for about 3 miles. The soil was dry clay. Two Dresser insulating joints were inserted in the pipe line, about 6 feet on either side of the trolley tracks. About 4 months ago this pipe was uncovered at several points along the line on both sides of the trolley track and directly under one of the insulating joints. An examination of the pipe did not reveal any electrolytic action.

Reply No. 6.—Dresser insulating couplings are used for steel mains with considerable success. Early last fall tests were made to ascertain current carried and found as high as 10 volts and 10 amperes positive to rail of trolley road. By means of 4 couplings placed in successive joints on each side of trolley line, this was reduced to 1.4 volts and 1 ampere. There were two points of almost similar character and both yielded to like treatment. The pipe is now fairly free from current flow, although we are still getting considerable from the water pipes which are heavily loaded from poor bonding of rails. We have been able to break it up to a great extent by means of joints before mentioned. It has been our experience that less than 3 joints in succession are insufficient, as current appears to go around one coupling and to continue on mains. One of our lines (3-inch) runs beside car barn and transforming station and under yard rails. This main is heavily coated with pitch and tarred burlap, and is connected with insulating couplings for 200 feet each side of yard. We cross under lines at two other points and insulate as mentioned above. The main has been in ground 2½ years and has never given trouble of any kind due to electrolysis. The water mains are laid with cement joints about 600 feet apart and are bonded to the rails. These have been badly corroded by electrolysis and several hundred feet had to be replaced.

Reply No. 9.—A 6-inch, wrought iron pipe line, with all Dresser joints, is laid within 6 feet of trolley tracks and transformer station and has been in service 6 years. Tests show that the main does not carry any measurable current and no trouble from electrolysis has been found.

Reply No. 13.—A 2 inch, extra heavy, wrought iron main with screw joints connecting gas works with filling pots of metal, was boxed in coal tar pitch. About 30 amperes was found flowing from works on pipe to filling pots. A number of leaks developed on line, but trouble appears to have been eliminated by dividing the line into insulated sections by insulated joints in addition to the insulating covering.

Reply No. 14.—A 16 inch, wrought iron main, 3,000 feet long, was laid with Dresser insulating joints about 19½ feet apart. The pipe line has been in service 6 years and there are trolley tracks at each end and at right angles to the line. The trolley power house is about ½ mile beyond, and to one side of the pipe line. Tests made show no flow of current and so far no electrolytic action has been found.

Reply No. 17.—The amount of pipe used in our system here is in excess of 1,000 miles, and reports to date on tests for electrolysis cover a little over 500 miles. No indications of any of the lines being charged with electricity have been found. In the construction of the plant we used Dresser insulating couplings for most of the pipe joints. We began the construction of this plant in 1902, and have made tests for electrolysis at intervals of about 1 year from that time up to the present. Owing to the street railway troubles here the construction

of the railway tracks is very imperfect, and our freedom from electric current cannot be attributed to anything but the system of construction adopted by ourselves.

Reply No. 25.—Several miles of wrought iron pipes laid with all Dresser couplings have been in service over 5 years. The line parallels and runs close to trolley tracks for a considerable distance. Careful tests made show that the line does not carry any measurable current and no experience from electrolysis has been met with.

Reply No. 37.—Dresser insulating joints are used on high pressure steel mains in a number of towns in proximity to trolley crossings, and have been in service from 1 to 6 years. Mains close to poorly bonded tracks have given trouble. Frequent tests are made and where stray current is discovered the railroad company is requested to stop it by bonding rails, etc., and it is to its interest to provide a good carrier for its current.

Reply No. 50.—Several miles of wrought iron mains, with Dresser couplings, spaced 500 feet apart, were in service 8 years. A great deal of trouble from corrosion due to electrolysis was found. These joints are now all bonded over by copper wire and the mains are bonded to the negative return of the power house.

Reply No. 136.—High pressure, wrought iron main was laid with insulated joints about 500 feet apart. Destructive electrolysis developed close to the joints, and for 400 to 500 feet of the main opposite the power house, where most of the pipe was dangerously pitted. This section of main was renewed, and is now connected with 5 copper cables to the return conductor in the power station. No tests have been made since this was done.

Reply No. 47.—Nine miles of wrought iron mains are laid with an insulating coupling every 500 feet. Trolley tracks parallel most of the line and power house is about at the middle of the line. Line has been in service for 4 years. At a point where several car lines come together the pipe was found to be from 6 to 8 volts positive to the tracks and 200 amperes could be drained to the track. So far no signs of electrolysis have been found.

Reply No. 44.—Thirty-four miles of 12-inch, wrought iron, screw-jointed mains are laid with Dresser expansion sleeves located every half mile. The line is 7 years old and parallels a very badly constructed trolley road for its entire length. The main is under tracks at places, but generally parallels the rails at an average distance of about 15 feet. Three power houses are located along the line of this main. Pitting, with consequent leaks, were found where the main lay in damp soil in vicinity of power houses. Trouble is due to electrolysis, as the small recesses in the pipe were filled with a dark substance and the surrounding soil was colored by the impregnated iron. Voltmeter tests showed the gas mains positive to the rails at these points.

EXTRACTS QUOTING EXPERIENCE WITH INSULATING PIPE COVERINGS.

Reply No. 4.—Since 1898 service pipes have been coated with a paint made of a mixture of coal tar, crude rubber dissolved in turpentine and resin. In localities, where a 2-inch pipe had to be renewed once in 9 months, it was found that this paint increased the life to about 2½ years.

Reply No. 7.—In the positive area where mains cross under trolley tracks they are inclosed in a wooden box and the space between the pipes and the box is filled with cement. The object in using cement is not so much to protect the pipes from electrolytic damage as to protect them from mechanical injury after a certain amount of corrosion has taken place. This is not considered by any means an approved protection, but it has given some protection.

Reply No. 12.—The coating known as "Cincinnati mixture" is used for service pipes only. The mixture consists of coal tar and other ingredients. In addition to this coal tar coating the pipes are wrapped with muslin, which is afterward painted with tar. Our experience is that this form of covering of the service pipes prevents ordinary corrosion, but does not fully prevent electrolytic action.

Reply No. 13.—A 2-inch, extra heavy, wrought iron main, with screw joints, has been boxed and covered with No. 6 coal tar pitch. This main connects the gas works with filling pots of metal. The main was found to be carrying about 30 amperes from the works to the filling pots. A few cases of leaks were found in this main. In some of these it was found that dirt had been permitted to get into the pitch and then probably formed the first opening to the pipe. Other leaks were found where the pitch had been disintegrated or decomposed, leaving a brown, powdery material. The trouble has been eliminated by dividing the line into insulated sections. Service pipes have been surrounded by a V-shaped trough and then covered with a mortar composed of coal tar and sand, well tamped and heaped over the middle. This mixture has given ample protection from corrosive action of the soil, but has not helped materially from electrolysis.

Reply No. 14.—Experience with insulating coverings on services has shown that they retard a general corrosion, but any spot that becomes exposed is destroyed more readily than if the area exposed were larger.

Reply No. 22.—In 1886 our services were first laid in a V-shaped trough. This trough was made of 1-inch by 4-inch undressed white pine strips. We gave the pipe a coating of coal tar and then filled the box with a mixture of tar and sand, after which the box was closed by placing another strip on top. It was found that this was a good preventative to the pipes from rust, corrosion and frost, and where other trenches had undermined our service pipes this box served as a support to prevent the pipe from settling and trapping. However, it did not protect the pipe from electrolysis, as our experience proves. About 3 years ago the practice of boxing services was discontinued.

Reply No. 25.—Service pipes crossing under tracks were laid in wooden boxes filled with tar, but it was found that while the boxed portions of services were protected, the pipes were eaten out on each side of the box, and services laid without boxes close to those boxed showed no signs of electrolysis.

Reply No. 26.—There has been a great deal of trouble from services being eaten out by electrolysis. To protect the services some have been placed in a trough of cement, particularly in the neighborhood of the power houses and where the ground is very wet. In several cases this cement cracked and and the services have been eaten out at such points; in other cases services have been eaten out beyond the points where they were cemented; that is, which were beyond the curb line.

Reply No. 32.—Several coatings on services have been tried but only one has proven effective; this is a substantial covering of coal tar pitch poured hot into a box around the pipe. During 4 years' service not a single case of corrosion has been found.

Reply No. 33.—Service pipes have been protected by boxing and fllling box with coal tar pitch, the covering extending about 6 feet beyond the rails on each side. This appears satisfactory, since services which were formerly eaten out as often as 3 times in 1 year are now 20 months in service and have developed no trouble.

Reply No. 39.—At present Cremo coating is used, which is composed of coal tar, powdered lime, powdered resin, tallow and rubber cement. This compound is applied to service pipes while hot and wrapped spirally with light drilling. This coating affords a fairly good protection to service pipes.

Reply No. 43.—Service pipes which have been used to replace those affected by electrolysis have been coated with Elateroid, 0.5 paint, during the past 3 years, and this has given satisfaction. One pipe used to be replaced every 4 months.

Reply No. 44.—A pipe was enveloped with concrete, which did not prevent electrolysis, but apparently retarded the action. Insulating (mica compound) couplings between main and services have also been used, but found that they did not prevent electrolysis.

Reply No. 46.—A 1¼-inch service pipe from a cast iron main near power house was found entirely destroyed 2 years ago. This was replaced by a new service pipe which was incased in a tar and cement concrete, cutting the acid in the tar with lime. Upon close examination 1 year later the current had not affected the service pipe nor the gas main.

Reply No. 53.—About 2 years ago the service pipes in one locality were covered with a cement coating and no trouble has developed since.

Reply No. 138.—Some of the 3-inch mains were laid in concrete, the latter being carefully made and the whole work being very carefully done. In spite of this a few cases of slight electrolysis developed, and it was clear that the concrete used alone did not prevent electrolysis. A portion of one of these 3-inch mains was laid by constructing a box and surrounding the pipe with from 2 to 3 inches of hot pitch, but here again electrolysis developed. It seems that the work was not well done at the points where the boards composing the box were put together. Recently this main was uncovered and the pitch removed. It was found that where the pipe was covered with pitch it was bright and clean. It seems certain, therefore, that if the pipe is surrounded with 2 inches of pitch and the whole incased in a box so as to prevent mechanical damage, the pipe will be very fully protected. In the positive districts of the city, or where there is a certain black soil which corrodes pipes very rapidly, the service pipes are treated in the following manner: First, the service pipes are heated by running steam through them, and then a coating of tar in which the ammonia has been killed with lime is brushed on the pipes, a layer of Manila paper is then wound on, then a second coating of pitch, then a third coating of paper, and frequently a fourth layer composed of pitch and paper as above. The last coating of paper is simply used to facilitate handling. This method of protecting the service pipes has proven very efficient and very few pipes so treated have failed. A few pipes, however, which were so coated have been destroyed by electrolytic damage. It may be, however, that this was caused by some mechanical injury to the coating.

The President—Gentlemen, what action shall be taken on the Report of the Committee on Electrolysis?

Mr. Gartley—I move that it be accepted. [Seconded.]

Mr. McDonald, Louisville—Prof. Ganz has told us a great many things about electrolysis. He does not tell what progress has been made towards compelling the railroads to take care of their own stray currents, and that is what I should like to have heard. I am told there are some cities in which that has been done, whether legally or otherwise I don't know; but if any progress has been made in that direction which would be of assistance to other companies in compelling their railway companies to take care of their currents, it would be very welcome information to me.

Prof. Ganz—In that connection I can only say I know of two cases where railroad companies are taking care of their own currents, but I am not prepared to speak of them. I do know of a good many others where they are paying for damage, that I am also not pre-

pared to speak of. Perhaps some of the gas men present here can talk of this—I see some who are receiving from railroad companies money to pay for damage from electrolysis—it is up to them to speak out.

The President—The motion is on the acceptance of the Report of the Committee. [Put and carried.]

The next matter on the programme is the

REPORT ON UNIT OF LIGHT,

Dr. A. C. Humphreys, Chairman. The report will be read by Mr. Gartley.

Mr. Gartley—I will not take the time to read the report in full. I simply want to say that the appointment of this Committee, and the procedure that led up to it, are all set for thin last year's proceedings. The Committee was finally appointed to express the views of the American Gas Institute on their agreement to accept the value of the unit of light that was about to be agreed upon by the various Governmental laboratories in France, England and this country. We wanted to know, still more surely than we did up to that time, how the new unit would compare with the old. We felt that the American Gas Institute was far more interested in this matter than any of the other societies. The result has been that all the countries have adjusted themselves to a value of the unit that does not materially differ from that which is now used by the gas companies, which was a great load off the minds of the Committee. We, therefore, notified the Bureau of Standards that we acquiesced in the proposed value. Another purpose for which this Committee was appointed was to confer with the Bureau of Standards on other matters referring to the gas business. A question that came up was one of finer graduations and finer specifications for the pentane lamp. They found that some of the American lamps varied far too much from what they should in their value. The Bureau of Standards, in the last year's requisition on the government for money, included a sum of $10,000 for work to be done in investigating the eccentricities of the pentane lamp, and finding out what caused the apparent fluctuations that up to this time have been unexplained. Considerable progress has been made in that direction. The Bureau of Standards is still at work, and I would, as this report suggests, recommend that the new Technical Committee work in conjunction with the Bureau of Standards and follow this matter up very closely. But, so far as the unit of light is concerned, I am very glad to say the thing is accomplished and we have what we wanted. There is just one paragraph I want to read to you: "That your committee avails itself of this opportunity to put on record its keen appreciation of the broad view of the situation adopted by the Bureau of Standards in consulting with the associations representing the lighting interests of this country before committing itself to a definite course of action. Had the Bureau of Standards at Washington been represented by men deficient in ability to appreciate the working conditions existing in practice, this happy result, only obtainable through the co operation of the commercial interests concerned, would never have been reached.

REPORT OF SPECIAL COMMITTEE OF AMERICAN GAS INSTITUTE APPOINTED TO CONFER WITH BUREAU OF STANDARDS ON UNIT OF LIGHT.

Your Committee on the Unit of Light was appointed in October, 1908, with power to give the final assent, or dissent, of this Institute to the "Statement and Resolutions" adopted by the Joint Committee, composed of sub-committees of the American Institute of Electrical Engineers, the American Gas Institute and the Illuminating Engineering Society, at a session held in New York, February 14, 1908. [See page 405, "Institute Proceedings," 1908.]

The Committee was also empowered to represent the Institute in conferring with the Director of the Bureau of Standards, when invited so to do by him, on all matters referring to the gas industry. The point at issue at the time of the last convention is set forth in the resolution to be found on pages 422 and 423, "Institute Proceedings," 1908.

Briefly stated, there was uncertainty as to whether the proposed new unit would so differ from the one generally in use by our industry as to cause a serious disturbance in our business. It was proposed to test this by sending to the Bureau of Standards a pentane lamp, bearing the certificate of the Secretary of the English Gas Referees, to have its value expressed in terms of the proposed new unit. The lamp selected was received in this country is 1899, and has been used extensively in giving values to lamps of American manufacture sold to gas companies in America. On December 23, 1908, the Bureau reported:

"We find the Chance lamp (W. J. A. B. No. 51) in close agreement with our standard pentane lamps, and correct within 2 per cent., in terms of the standard candle of the Bureau on the new basis; that is, after decreasing our unit 1.65 per cent., as we shall shortly do, to come to a common value with England and France."

The information contained in this report confirmed your Committee in the belief that the proposed change in the Bureau unit would in no way disturb the gas industry, and this made it possible for the Committee to agree upon approval of the Joint Resolutions.

The following correspondence will show the progress made:

"Department of Commerce and Labor, Bureau of Standards, February 11, 1909. To Mr. C. O. Bond, Secretary, Joint Committee on Unit of Light, Philadelphia:

"Dear Sir—We have reached an agreement with the National Physical Laboratory, of England, and the Laboratoiré Centrale, of France, whereby we are to fix the international candle at 1.6 per cent. below the value of the candle which has been maintained at the Bureau since its organization, and expect that a simultaneous announcement of this arrangement will shortly be made in America, France and Great Britain.

"We have recently tested a number of pentane lamps and certified them in terms of this new unit, and find that, when reduced to a standard condition of eight liters of water vapor per cubic meter at normal barometric pressure, and burned in a very well ventilated room, the value of the English pentane lamps and some of the American, is 10-candle power within a tolerance of plus or minus 2 per cent. This, of course, is as we expected it would be, and shows that the gas interests that have been using the unit as given by the English pentane lamps will not have to make any change in the rating of their working standards.

"Has the Committee of the American Gas Institute taken any action on this matter as yet? We would like to be able to say in making the announcement that the Institute has officially recognized the new unit of light. Respectfully,

[Signed] S. W. STRATTON, Director."

NEW YORK, February 26, 1909.

Mr. W. H. Gartley, Chairman Committee representing the American Gas Institute in the Joint Committee composed of the American Society of Electrical Engineers, the Illuminating Engineering Society and the American Gas Institute on fixing upon the value of the unit of light, Philadelphia, Pa.:

"Dear Sir I have been informed, through a letter from Dr. S. W. Stratton, addressed to Mr. C. O. Bond, Secretary of the Joint Committee on the Unit of light, that the Bureau of Standards has 'reached an agreement with the National Physical Laboratory, of England, and with the Laboratoire Centrale, of France, whereby we are to fix the international candle at 1.6 per cent. below the value of the candle which has been maintained at the Bureau since its organization.'

"As Chairman of the Committee of the American Gas Institute, appointed to confer with the Director of the Bureau of Standards on the subject of the unit of light and other matters, and that Committee having been appointed, by vote of the Institute, to decide whether the Institute would, or would not, approve the adoption of the resolutions proposed by the Joint Committee, I now wish to notify you that the Committee has decided to approve those resolutions, copy of which is attached. Yours very truly, (Signed) ALEX. C. HUMPHREYS,
Chairman of Special Committee on International Unit of Light."

There was attached a copy of the Joint Resolutions.

"Mr. S. W. Stratton, Director, Bureau of Standards, Washington, D. C.: Dear sir. Immediately upon receipt of your letter of above date (Feb. 11, 1909), I communicated with the members of the American Gas Institute Committee, asking the result of their deliberations to date. I am able to transmit to day the inclosed letter to Mr. W. H. Gartley, from the Chairman of that Committee, he having in turn sent it to me, as representing their final action.

"As this completes the approval of the original resolutions by the three Societies appointing sub-Committ es to the Joint Committee, I now state to you, as Chairman of the Joint Committee, the final result.

"Awaiting your instructions as to whether there will be any necessity for further action by said Joint Committee, I remain,

"Very respectfully yours,
"(Signed) CHAS. O. BOND,
"Secretary, Joint Committee, Unit of Light."

This completed the first step—the procurement of an agreement by the American technical societies to the contemplated change by the Bureau of Standards in the value of the Bureau Unit. That change consisted of the reduction of the former value to the one which did not differ, within errors of observation, from the one then in use by our gas companies. Meanwhile, pending this final decision by this Institute, the Bureau of Standards entered into correspondence with the foreign national laboratories in regard to the possibilities and terms of agreement on a value which might be accepted as an international unit. The following history is extracted from Dr. E. P. Hyde's report to the Illuminating Engineering Society, September, 1909:

Following various informal conferences among the directors and other representatives of the different national laboratories, and after further determinations of the relations of the various national units, an agreement was reached by the Directors of the Bureau of Standards, Washington; Laboratoire Centrale d'Electricite, Paris; and National Physical Laboratory, London, upon a common unit of light, which should be maintained constant through the co-operation of the three laboratories.

The announcement of adoption of the unit was made in this country by the Bureau of Standards in Bureau Circular No. 15, May 20, 1909.

The proposal to call this common unit of light the "International Candle" has been submitted to the International Electro-Chemical Committee, which will endeavor to secure the indorsement of the proposal by all the countries of the world which are represented on that Commission.

Your Committee has also to report that, in view of the difference in value of some of the American and English pentane lamps, that the question of investigating the effect upon the lamps of different proportions of diluent incombustible gases and atmospheric vapors contained in the air supplied to the lamps be made a subject of special study by the Bureau of Standards, at Washington, as well as the effect of varying materials and dimensions in the basic features of the lamps.

In this connection, the Bureau of Standards included, in their requisitions for 1910, a sum of $10,000, which was granted by Congress, for the purpose of such investigation.

There has also been received in this country a standard pentane, 10-candle lamp from England, bearing official certificates of correct value from the London Gas Referees and the British National Physical Laboratory. This lamp is probably the only one in this country having the indorsement of both of these bodies.

We recommend that the Technical Committee to be appointed keep themselves closely informed regarding the development of the experiments being conducted on the pentane lamp by the Bureau of Standards, offering their services in consultation and at the proper time inform this Institute of the progress made. We are now in possession of a fixed international unit. We look forward to securing a practical reproducible standard.

Your Committee avails itself of this opportunity to put on record its keen appreciation of the broad view of the situation adopted by the Bureau of Standards, in consulting with the associations representing the lighting interests of this country, before committing itself to a definite course of action. Had the Bureau of Standards at Washington been represented by men deficient in the ability to appreciate the working conditions existing in practice, the happy result, only obtainable through the co-operation of the commercial interests concerned, would never have been reached.

Your Committee having performed all the duties imposed upon it by this Institute, and having brought those duties to a successful conclusion, asks to be discharged.

ALEX. C. HUMPHREYS,
WALTON CLARK,
W. H. GARTLEY,
A. G. GLASGOW,
R. B. BROWN,
} Committee on Unit of Light.

[A PROPOSED INTERNATIONAL UNIT OF LIGHT.

Issued from the Department of Commerce and Labor, Bureau of Standards, Washington, D. C., under date of May 20, 1909, under the classification "Bureau Circular, No. 15; 2d Edition," superseding the 1st Edition, issued April 1, 1909.]

The following announcement relative to the unit of light of America, France and Great Britain, is being made simultaneously in these three countries. The announcement is being made in Great Britain by Dr. R. T. Glazebrook, Director of the National Physical Laboratory, and in France by Prof. Paul Janet, Director of the Laboratoire Central d'Electricite. In order to determine as accurately as possible the relations between the photometric units of America, France, Germany and Great Britain, comparisons have been made at different times during the past few years between the unit of light maintained at the Bureau of Standards, Washington; at the Laboratoire Central d'Electricite, Paris; at the Physikalisch-Technische Reichsanstalt, Berlin, and at the National Physical Laboratory, London.

The unit of light at the Bureau of Standards has been maintained through the medium of a series of incandescent electric lamps, the values of which were originally intended to be in agreement with the British unit, being made 100/88 times the Hefner unit.

The unit of light at the Laboratoire Central is the bougie décimale, which is the twentieth part of the standard defined by the International Conference on Unit of 1884, and which is taken, in accordance with the experiments of Violle, as 0.104 of the Carcel lamp.

The unit of light at the Physikalische Techniche Reichsanstalt is that given by the Hefner lamp burning at normal barometric pressure (76 cm.) in an atmosphere containing 8.8 liters of water vapor per cubic meter.

The unit of light at the National Physical Laboratory is that given by the 10-candle power Harcourt, pentane lamp, burning at normal barometric pressure (76 cm.) in an atmosphere containing 8 liters of water vapor per cubic meter.

In addition to the comparisons of electric and flame standards, carried out recently by the national laboratories in Europe, one comparison was made in 1906 and two in 1908, between the American and European units, by means of carefully seasoned carbon filament electric standards, and, as a result of all the comparisons, the following relationships are established between the above units.

The pentane unit has the same value within the errors of experiment as the bougie décimale. It is 1.6 per cent. less than the standard candle of the United States of America and 11 per cent. greater than the Hefner unit.

In order to come into agreement with Great Britain and France, the Bureau of Standards of America proposed to reduce its standard candle by 1.6 per cent., provided that France and Great Britain would unite with America in maintaining the common value constant, and with the approval of other countries would call it the international candle. The National Physical Laboratory, London, and the Laboratoire Central d'Electricite, Paris, have agreed to adopt this proposal in respect of the photometric standardization which they undertake, and the date agreed upon for the adoption of the common unit and the change of unit in America was April 1, 1909. The following simple relations will, therefore, hold after that date:

1 International candle = 1 Pentane candle.
1 International candle = 1 Bogie décimale.
1 International candle = 1 American candle.
1 International candle = 1.11 Hefner units.
1 International candle = 0.104 Carcel unit.
Therefore, 1 Hefner unit ..... = 0.90 International candle.

The pentane and other photometric standards in use in America will hereafter be standardized by the Bureau of Standards in terms of the new unit. This, within the limits of experimental error, will bring the photometric units, for both gas and electrical industries in America and Great Britain, and for the electrical industry in France, to a single value, and the Hefner unit will be in the simple ratio of 9/10 to the international candle.

The proposal to call the common unit of light, to be maintained jointly by the national standardizing laboratories of America, France and Great Britain, the "international candle," has been submitted to the International Electro-technical Commission, which will endeavor to secure the indorsement of the proposal by all countries of the world which are represented on that Commission. It is hoped that such general approval may be secured, and that in the near future the term "international candle" will receive general sanction.

The above announcement marks an important step forward in the history of photometric measurements. For many years the British parliamentary candle was the unit recognized in this country, but the lack of precision in practical photometry did not permit its value to be very accurately expressed or reproduced. In recent years the gas industry has employed the 1-candle power sperm candle, the 10-candle power Harcourt pentane lamp, the Hefner lamp and various secondary standards, while the electrical industry has employed incandescent electric lamps, either certified by the Bureau of Standards or rated in terms of standards that are consistent with those of the Bureau. The unit of the Bureau has been maintained very constant, as shown by frequent comparisons with the standards of France, Germany and Great Britain, but differed appreciably from the British unit, and hence from the unit employed by most of the gas companies in America.

The Bureau of Standards took the initiative several years ago in bringing about international uniformity in the unit of light by sending its representatives abroad with copies of its standards to determine more accurately the relative values of the units of the several European countries and to urge the adoption of an international unit. In this country the American Institute of Electrical Engineers, the American Gas Institute and the Illuminating Engineering Society have acted together in support of the movement, and have voted in

advance to recognize the new unit of candle power. In England the National Physical Laboratory has secured the indorsement of the London Gas Referees and the Institution of Gas Engineers.

The union of the three national standardizing institutions of America, France and Great Britain, in maintaining a common unit of candle power, and the co-operation of the German Reichsanstalt in redetermining, from time to time, the ratio of the Hefner unit to the common international candle, assures the highest attainable constancy for the new unit of light.

Unfortunately there is no primary photometric standard that is sufficiently constant and reproducible to be generally accepted as an international standard. France, Germany and Great Britain each has its own primary flame standard, and a great deal of effort has been expended in attempting to determine accurately the relation between them. Until the flame standards themselves are better understood, however, and the atmospheric and other conditions more perfectly controlled, the unit of light cannot be preserved as accurately by primary flame standards as by incandescent electric secondary standards. The latter, when well made, properly seasoned and carefully measured, permit comparisons to be made (using the means of many settings on several lamps) with excellent precision, the lamps themselves being constant enough and the precision of measurement high enough to fix the final values to about 1 or 2-tenths of 1 per cent. There is good reason to believe that in this way the international unit of light can be preserved so nearly constant that any inevitable drift occurring one way or the other would be too small to detect with certainty by any of our present flame standards in many years. The Bureau of Standards will continue to standardize flame standards and will also carefully investigate the more important flame standards. Similar tests and investigations will also be made in Europe, and if any appreciable drift does occur it will sooner or later be detected.

Careful distinction should be made in this connection between a *unit* and a *standard*. An international unit maintained by the cooperative effort of several national standardizing institutions, and checked from time to time by means of all the best primary standards in use, is more likely to be maintained constant than if it were defined to be represented by any single primary standard, unless such a primary standard were reproducible to a very high degree of precision. Such a *unit* can be continued permanent even though all present primary *standards* are ultimately superseded by better ones. The Hefner lamp as a convenient flame *standard* will not be displaced in America or any other country which adopts the international candle as its unit of light. Uniformity among different countries and continuity of value are prime necessities with respect to the *unit*. But the particular standard by which the unit is realized in practice is largely a matter of convenience and circumstance. In the photometry of electric lamps, electric standards are most suitable. In gas photometry one form of flame standard or another will be employed accordiug to circumstances. It is not expected that all countries of the world will at once adopt the proposed international candle as their unit of light. Those countries which already have the Hefner unit in general use may prefer to continue it. But if all countries which have a unit differing appreciably from the Hefner shall adopt the international candle as their unit, there will then be only two units in use throughout the world, and they will have the simple ratio 9 : 10. This would result in a distinct gain both in the practice of photometry and in definitions and nomenclature.

The effect of this change of 1.6 per cent. in the unit of the Bureau, which is in general use for electric lighting throughout the country, is to raise the candle power rating and decrease slightly the watts per candle of electric lamps. A 16-candle power lamp will give 16.26 candles in the new unit, or a 16-candle power carbon filament lamp, burning at 110 volts, will give 16 candles on the new basis at 109.69 volts. The change, though small, is important in the photometry and rating of lamps.

The new unit of candle power being in agreement with the present English unit, as represented by a 10-candle power standard pentane lamp, there will be no change in the unit of light now employed by those gas companies which use pentane lamps, provided they are in agreement with the English standard. But as pentane lamps may differ slightly from one another, even when burned under the same conditions, it is desirable for the sake of greater uniformity to have them standardized in terms of the standard candle of the Bureau. These variations, amounting to from 1 to 5 per cent., are, generally in the same direction; that is, the lamps, if not correct usually give less than 10 international candles under standard conditions when burning in a pure atmosphere at a normal barometric pressure of 76 cm. of mercury and an atmospheric humidity of 8 liters of water vapor per cubic meter. In anticipation of this change some of the largest gas companies in the United States have already had their pentane and Hefner standard lamps standardized by the Bureau in terms of the new unit.

Gas standards will hereafter be certified in terms of the international candle; electric standards will be certified in terms of the old unit until July 1, 1909, unless otherwise requested. On July 1 the new unit will be adopted by the Bureau of Standards in the certification of electric standards, and it is hoped that manufacturers of electric lamps will adopt the new unit as soon thereafter as possible.

The Bureau recommends that all gas and electric companies, all photometric laboratories, and all the manufacturers of electric lamps in the United States, adopt the new unit of candle power, if possible, not later than January 1, 1910.

Further information with regard to change of photometric unit or to the testing of gas and electric standards will be given on request.

The President—You have heard the report of the Commitee on Unit of Light. What action shall be taken? [Approved on motion of Mr. W. R. Addicks.]

(To be Continued.)

[Continued from Page 1253.]

PROCEEDINGS, SEVENTEENTH ANNUAL CONVENTION OF THE PACIFIC COAST GAS ASSOCIATION.

Held in San Francisco, Cal., Sept. 21, 22 and 23.

Second Day—Morning Session.

The Chairman—Mr. Kuster will read a paper on

THE GAS EXPOSITION AS A MEANS OF ADVERTISING.

[For the text of the Kuster paper, see Journal, *ante*, Oct. 4, p. 811.]

Discussion.

The Chairman—Will Mr. Parker kindly open the discussion on this paper?

Mr. Parker—I hardly can add anything to the paper, although much good can be brought out by discussion.

The Chairman—Mr. Lowe.

Mr. Lowe—I have asked permission to speak, so that I might give you a thought which has been running through my mind the last few months. It refers particularly to the appliance men, so others of you will perhaps not be so interested. It is an easy matter for a large gas company to hold any kind of an exposition deemed advisable, whereas it is an extremely difficult matter for a small gas company to do it. Consequently I had a thought that, if the appliance men would get together a sort of moving exhibition, taking it around from place to place at set dates, and exhibiting it in a hall which would be previously engaged and arranged by the local company, they could accomplish a world of good. Large gas expositions have been held in New York and Chicago, but it seems no other towns in the country were large enough to hold really creditable gas appliance exhibitions. Now, by the method which I propose, that benefit could accrue to the small company and also to the appliance man. We all know there are far too many gas appliances now on sale for a company, no matter how large, to think of having even a sample of all of them. It is out of the question; they couldn't afford it. Of course, many of these appliances will sell, and they only have to be seen to sell, and if the appliance men, speaking particularly of the Pacific Coast, would get together and arrange a traveling exhibition, I am very sure that the gas companies would provide a hall and pay the local expenses. Of course, the appliance men would naturally pay expenses of transportation, etc., but the local gas companies would be only too glad to hire the hall, arrange for its proper piping, secure the proper dates to suit the convenience of the exhibition, and enjoy the particular benefits that would come from having it in their towns. In that way a great variety of appliances would be shown and many sold, and it would be a profitable undertaking for the appliance men, who could take orders through the gas men, and which the gas men would never have the opportunity of getting, because of the fact that people would see appliances which in no other way would come to their notice. It strikes me as a very practical plan and one that could be easily arranged. The exhibitions would be held over periods of time depending on the size of the town. No town would want less than two days, and large cities would want two weeks. It would be something like

a circus, and I am sure it would pay. A good name for it would be the "Gas Circus."

Mr. Leach—I want to say Amen to everything Mr. Kuster has said. We tried a gas exposition immediately following his, and it lasted 2 weeks. We made as an additional inducement for the purchase of gas apparatus, the giving of a certificate for $10 worth of gas free for every gas range or automatic water heater or hot water heater sold during that time. We had the pleasure of issuing somewhere in the neighborhood of 350 certificates. There is no question but that a gas exposition would pay in any town that is of any size, and I heartily approve of the suggestion made by Mr. Lowe. In the smaller towns I believe that the appliance man would find it of great value. Mr. Kuster spoke of the educational feature in the schools. Regarding that I would like to say that for a number of years it has been our policy to fit up the different schools in the district, the different new buildings that had been built, which have been provided with manual training departments. We fitted up the room in which the cooking lessons were given free of charge to the city. The equipment is a 2-oven gas range with ordinary burners, a circulating water heater, and approximately two dozen individual hot plates, arranged around in a hollow square for the easy convenience of the teacher. We now have somewhere in the neighborhood of 15 or 20 schools so fitted, and I assure you it is an excellent investment. The children that are learning to cook are learning to cook with gas, and they are learning the ease with which they can have hot water with gas. I will state that by-and-by, whether those children become housewives or live to be old maids, they will cook with gas.

Mr. Osborn—A point which I think has not been touched upon in educating the consumer or the cooks is in the small towns—I don't know what the experience of other managers in small towns is—with reference to the matter of using gas in the large restaurants and hotels. My experience is that the proprietor or manager of the hotel, when the subject is broached to him, will reply that his cook won't stand for gas. It looks to me as though it should be a matter of educating the cooks of hotels in the way of using gas, in the matter of showing them the great convenience and benefit of using gas in preference to coal. The small towns in the interior, of course, find coal a very great item, and I know some hotels are spending from $50 to $80 a month for coal. It looks to me we can get that business, and we should have it, but the fact that the cooks themselves will not stand for a change is in the way. I think it is a matter that should be taken up by the gas people, and that someone should be sent to these towns to endeavor to take it up with the managers of hotels, to convince them that permission to instruct the cooks in the use of gas would be wise. We have, for instance, about four hotels in our town, that don't use gas for fuel, and it seems we are losing an income there of from say of $150 to $200 a month that we ought to have. Now, in the matter of teachers of cooking in these different towns. We had them in Woodland for a few days. Unfortunately I was not able to make an exhibition of gas appliances, for the reason that a day or two previous to their arrival we were visited with a heavy north wind, and our entire crew was compelled to repair electric services—you know in a small town every man is a gas man and an electric man—and it kept us on the jump for several days working overtime. The result was, when the cooking teachers arrived, we were hardly prepared to receive them, greatly to my disappointment. I appreciated their lectures very much, but I agree with Mr. Petch that a good woman demonstrator can do more than all the cooking teachers. Mr. Valentine's remark in regard to taking the business away from the appliance men, or the hardware men in the small towns I hardly agree to. I think we should educate the hardware men to handle gas appliances as well as ourselves, for this reason: Take the town in which I am located with three large hardware firms, and if they don't handle gas appliances they are bucking gas appliances. In other words, they are all selling a gasoline stove and trying to sell it in preference to a gas stove, and their customers go in there, and they immediately commence to knock the gas appliance. Now we want them to be our friends, and it seems to me that extra inducements should be given the hardware men to handle our appliances.

Mr. Basford—The trouble with the hardware man in general, and especially the hardware men in small towns, I know from my experience and that of other men, is they have so many different things to sell they can't make a specialty of anything. Gas ranges and gas appliances are specialties. It takes a special man of special education to be successful. Travelling around to different cities—I remember visiting Monterey, for instance, and hearing it said: "Oh, we can't handle any of the appliances, the gas companies sell them at cost." That's the old cry; but at the same time if the hardware man handles an appliance, he is not going 1 foot out of his way to sell that appliance over any other. The gas company must sell the product. I remember visiting one town with a small appliance that we had. We sold one—just a sample. I never had another order, but in that same town inside of 3 months the gas manager has placed 50 of those appliances in homes. Now what does that mean for the gas company? You have to sell your appliances. You can't help it. As to the gas exposition, from Mr. Lowe's standpoint, I think I was the pioneer in starting that to a certain degree, but I was trying to go it alone. I was willing to go to the expense alone, pay for the advertisement and visit the town from 1 to 3 days, sent out progressive advertisements in advance of my arrival, and for all that I know it would pay for a number of gas companies to do that. Mr. Lowe is right in saying there are too many gas appliances on the market for any one company to try out. There are many of them, and they all receive their share of business, for the call is made for them, when the people know of them, and it is in this way they can be brought to their attention. I think it is a wonderful privilege to have a gas company give us a chance to exhibit what we have. I would like at the close of this meeting to have the gas appliance man stay here for about 5 minutes to see if some organization could not be started, so we could work up next year's proposition on that line. I am satisfied the gas companies will give us everything we ask for. They will use their money in the local expenses, if we will spend the balance, and I would like to see it, and I will ask that you meet me here at the close of this meeting just a few minutes to get a few ideas, and we can work it up by correspondence later.

Mr. Petch—Speaking as a representative of a small town, I shall be extremely pleased to welcome the gas circus, but I maintain that every small gas company can afford to keep a gas exposition of its own, and if it does not, it never can reach the degree of efficiency that it should. Take the average dealer in small towns, who carries gas ranges, gasoline stoves, vapor stoves and wood stoves, and I have it from a wholesale dealer who sells both sorts, that there is a great deal more money to him and his firm when he sells a coal stove. What is the result? If the gas people leave this in the hands of two or three men in a city to handle that which is of vital importance to them is that which they will advance? A few years ago 95 per cent. of our gas was sold for lighting purposes, but in California to-day probably 90 per cent. of it is sold for fuel purposes. The conditions have been exactly reversed. Then, just to gain the friendship of two or three dealers in the town, I don't believe it is good policy for a company to leave the handling of appliances in other hands. As an example: A short time ago I went to a city to take charge of a company, and the company did not handle the appliances. In fact, there were only about a dozen appliances in the three or four stores in town. But right opposite us, in order that I might have some opportunity to keep in touch with it and boost it to a certain extent, I asked a party to go into the appliance business, and he did. Some months afterwards I took a prospective customer to this place and was met by a woman. The very first thing that she did when I went in, and introduced the man as a prospective customer for a gas range. was to tell him that the gas was no good; that she couldn't use it in her kitchen; that it smelled. This is not probably feasible in a large city. but in small cities of 12,000 to 15,000 people they want us to leave this valuable medium in the hands of two or three men who would rather sell anything else—in fact, these men are "knockers." Let them do it. They will knock us anyway. If they can knock a gas range and sell a coal range and make $1.50 more profit they will do it every time. It is up to us to keep an attractive display, and it will not cost $500. We can keep almost every appliance that will go in the makeup of an ordinary kitchen. I don't believe ours to day represents $500, and in the 4 months we have had it we have sold 200 ranges, 100 water heaters and 35 hot plates—the latter much to my disgust; but we had to sell them.

The Chairman—Half a loaf is better than none, Mr. Petch.

Mr. Parker—Passing to the point that Mr. Leach brought out a while ago as to domestic science equipment, I will say they are now becoming generally installed in almost all high schools, State normal schools and a great many grammar schools back East and in the South, and that there is a firm making appliances of this sort, who would be very glad to furnish you with blue prints showing the installation and drafts of how to put up the tables, with drawers pulling out, making seats for students, though my modesty prevents me from stating what firm would be glad to furnish them. I want to tell you of a little incident that came under my notice. A commercial man told me that he installed a range one day, and he went

around the next afternoon, being out in the same neighborhood, to see how the range was working. They took him into the kitchen, and the colored cook was using the range. His first question was, "Auntie, how do you like your new gas range?" "My," she said, "that's a mighty fine range; that fire ain't gone out yet."

Mr. Lowe—The only objection I have to placing gas stoves on sale with the hardware people is their great skill as salesmen. They know a hundred time more about selling merchandise than we ever will know, and the secret of their success lies in anticipating the customer's desire. They are very, very careful to find out about what you want to spend and exactly the kind of article you are looking for before they call it to your attention. If they discover they can sell you a coal stove easier than a gas stove, they are going to sell it. If you want a gas stove, they will sell you that stove. Our practice is to put stoves in the hardware stores without cost to them, permitting them to sell and make all the profit arising from the sale without a particle of investment on their part; but they don't sell many stoves, even under these circumstances, because the people who go into the hardware stores as a rule are not looking for gas stoves. The gas companies have educated consumers to call at their stores, and while we do effect some sales through hardware men, you must expect these dealers to sell the appliance the customer wants. Naturally he is going to try and find out, when the customer enters the store, what he wants before he urges a sale.

Mr. Leach—This matter of hotel and restaurant business certainly looks very good. It would be very remunerative, and I say will be very remunerative when we get it. The difficulty you have is it getting the *chef* to be willing to use a gas range. We have tried several times to have put in on trial a large gas range that would be amply sufficient to do all the cooking that might be desired or necessary, and still the range came out after a short time, simply on account of the prejudice of the cook. Now we have taken the matter up along this line, that is, the line of education. We first started in with the coffee urn, and showed them the gas coffee urn was just the thing; in Oakland you find practically all the coffee is made by gas. Then Mr. Mulgrew, Superintendent of that department, designed a gas hot water table, which takes the place of a steam table, for holding large kettles of food to keep warm during the serving time. Several of them have been put in. We have short order tables, for frying and broiling, and then we have placed, in addition, a number of special pastry ovens; I believe before we get through with it we will have the hotel kitchen a gas kitchen. You can't do it in one jump. There is no use in trying. You have to educate them piece-by-piece.

The Chairman—Will Mr. Poingdestre favor us with some ideas?

Mr. Poingdestre—In Marysville we have two leading hotels, both of which are supplied with gas, and both cook with gas. The principal one is not using quite as much as I might desire. Regarding the restaurants, we have a number of "dago" chop houses, all using gas, and some of them pay us as much as $50 to $70 a month, which, of course, largely adds to the revenue of the company. They are meeting with great success. That is about all I have to say as to the use of gas in those places in our town.

Mr. Petch—Has anybody had any experience with a distillate burner that is now being used to some extent?

Mr. Lowe—Mr. Cline ought to be able to tell you something about it. All the hotels in Southern California use it.

Mr. Clarke—That seems to be our principal trouble. Our distillate burner can be run in a restaurant or a hotel at ¼ the cost of which we could furnish gas, although we have gas in some hotels and clubs.

Mr. Lowe—What price for the gas?

Mr. Clarke—$1.10.

Mr. Hill—The hotels down our way are using crude oil, and with splendid success, too. I tried to talk gas to a hotel manager, who is a warm personal friend, but he said, "Do you know what it cost me for my fuel last month? It just cost me $15. If you can beat that, or meet it, I am going to talk business to you." I threw up my hands.

Mr. Lowe—That's the right idea. It is a matter of cost. In the cheap natural gas fields you will find they all use gas. In Southern California you will find they use distillate, and they are beginning to use it up here. Now if you want to know all about this for yourself individually, put an equipment in a hotel, such as you know will be satisfactory for the use of that hotel, and let them use whatever gas is necessary for their needs. At the end of the month read the meter and calculate at what price you would have to sell them gas to compete with fuel of other descriptions, and you will find you couldn't get 50 cents, in many instances 25 cents, per 1,000 for it. That's the whole story in a nutshell.

Mr. Hill—Another thing that occurs to me which probably touches on this subject is the matter of general appliances. I think it is pretty generally conceded that the proper thing, especially for small gas companies, is to control the sale of all gas appliances by keeping a suitable exhibit and pushing the gas appliance sales as suits the interest of the company best. Another thing in connection with that, in my observation, is that we do not get just the character of support from the appliance people that we do from the electric appliance people. If we buy an electric motor and anything goes wrong with it, we get an expert from the representative of the electric company to right it. The company is always glad to send a man down to demonstrate and instruct us in the peculiarities and operating conditions necessary to make a motor a success. We don't get that character of support from the gas appliance people. Frequently we bought gas appliances which the salesman said would do so and so. Then he would show some advertising matter, nicely gotten up; then show me how the device would burn, making a slight demonstration by merely lighting it and turning it off, not telling me of any of the trouble, like the electric man does. The electric man will say if you do this or that you will get into trouble. In other words, he prepares you for the troubles you are apt to get into, and anticipates the natural mistakes you may get up against. The result is we have had a great deal better success with electrical appliances. We have had a great deal better support from the electrical fraternity than we have had generally from the gas appliance fraternity; and I feel that the movement this gentleman is attempting to inaugurate will overcome that thing largely. One other thing I believe the gas appliance people could do for their own benefit, and which would help the gas fraternity generally, is to adopt the practice of the electric manufacturers, of sending out a very plain, concise and comprehensive tablet or book of instructions as to how to install and how to operate the apparatus. I think this is generally the experience of the gas managers. especially in the small towns. Their help is coming and going. They cannot put a gas engineer in and pay him a salary to install the gas appliance, and even if they did have such a man to do it, the one who manufactures the apparatus is probably the best one extant to install it. He knows just what it was built to do, and if he does not impart that knowledge to you in some way you will have to scramble around and do a lot of experimental work that has been already done in the manufacturer's laboratory. You have to do that yourself. I fear there is a lot of trouble due to the lack of information forthcoming from the gas appliance people. This is merely a suggestion, but it has been my experience.

Mr. Basford—This discussion creates the thoug ht in my mind that many gas appliances have fallen into disuse for the reason that the average gas appliance is sold by a jobbing house. That the salesman who sells this appliance is not often an expert in it. Of course, many appliances must be sold through jobbers, but I believe many salesmen would be glad to visit houses in which appliances are installed were it not for the fact that the firms they represent insist on their getting over their territory in a certain time. It is a short-sighted policy. By calling at the houses where gas appliances are installed, becoming acquainted with the people, showing them how to work or operate the devices, it creates a good impression by showing you are taking an interest in the customer. It sells more goods for you, and in the long run gains friendship for the gas company. These men are busy men, and they should be helped out. Their workmen get small wages, a good many of them are migratory, and we must help them out. I think the gas appliance man is much in error in not doing that. His goods are sold and he wants to forget them. He can't forget them, because they are coming back to him with every device that is not working in the shape of a dozen sales lost. We make a practice of going to every job that is installed and seeing that the customers are satisfied, which I think should be attended to by all gas appliance men.

Mr. Britton—I think Mr. Poingdestre is correct in the assumption that the following-up idea has been neglected, and that the gas appliance men feel that after a sale is made that it is done with, and that attention is not given to the man making the sale for you. You place a line of samples with a gas company or an appliance house in the town and feel you have done your share, and it is left with him to carry the work along for you and to make your money for you when you are absent. This is an error. From my short experience in the appliance line, I believe, if this idea were followed up if some organization could be effected, or if some personal attention could be given to the sales and to the satisfaction of the sale both to the consumer and to the jobber who makes the sale for you, that a better feeling of

friendship could be developed between the salesman and the seller, and it would result in a benefit not only to the appliance house and the manufacturer, but to the gas company, first, last and always.

The Chairman—Mr. Basford, I have no doubt the convention will be very glad to hear of the result of your conference with the appliance men. Before adjourning, I want to say to Mr. Lowe that, prior to his coming to the meeting, a motion was made that a telegram be sent to Mr. Britton, a sort of good fellowship telegram, and I appointed him the committee to prepare and send it.

Mr. Lowe—I thank you very much. I think Mr. Britton has the cablegram now. For a very excellent reason I cannot tell you its contents just yet, nor what that reason is, but I will explain it to you a little later. I will whisper it to anyone individually, if he will promise not to tell the other fellow, but I cannot report as yet.

Mr. Van E. Britton—Mr. Britton is due in Hong Kong the 23d, which, after making allowance for the difference in time between the two places, would be to day; that is, the 22d. He is due in Hong Kong at 10 o'clock to-day.

Mr. Lowe—I have whispered it in the ears of Mr. Jones and Mr. Martin, and they say my reason is absolutely valid. I cannot yet tell you the contents of the cablegram. [Adjourned to 2 P.M.]

(To be Continued.)

Ways for Holding Round Materials.

[Communicated by "R."]

In the gas works, where pipes and shafts are held almost constantly, gripping devices are employed in greater variety than almost anywhere else, and simple and inexpensive gripping contrivances are not only useful in gas works but are also necessary, as is known. In the making of a gripping instrument for round surfaces the matter of friction enters as one of the important elements. There are various types of holding instruments in which excessive pressures with corrugated surfaces form the holding surfaces of the device, but there are other styles of gripping apparatus in use in which dependence is placed entirely upon the adhering properties of a smooth surface against a smooth surface for the grip. The wood pulley furnishes a good example of the power derived by squeezing one rounded surface down upon and securely to another surface of corresponding dimensions. When there is a slippage such trouble is due to defective mechanical adjustment, but sometimes the butts of the exterior object meet before the proper pressure is brought to bear upon the interior surface by the pressing surface, which takes away much of the surface adhering power, thus the desired grip is lost and the wheel will slip. The same principle is applicable when the grip is applied to a pipe surface.

In gas works gripping devices are employed frequently when it becomes necessary to turn a pipe, for a clamping arrangement is needed to take the place of the pipe wrench, whereas in ordinary work the pipe wrench can be used.

The pipe wrench marks may be objectionable, but these cannot be avoided with tools of this order. When it is required to turn a number of pipes of the same proportions, it is advisable to rig up a gripping device for retaining the pipe in the turning lathe, and common wooden gripping contrivances are extremely useful in this line of work. You should procure a good grade of hardwood from the nearest woodworking plant and proceed to arrange the sides of the grip; a good fit is needed. One way to determine the character of the grip obtainable from a binding surface, formed with two surfaces pressing upon a similar smooth surface, is shown in the first drawing. You may take a coarse file and revolve it readily in the block bore, as at *A*, Fig. 1. The rough surfaces of the file do not grip tightly on the smooth surface of the hole, and you simply file away more of the wood fiber in forcing the file end deeper into the hole; but if you have the hole in a smooth order and project into it a round stick of kindred form, like *B*, Fig. 2, then you will realize what a grip one even surface can be made to take upon another surface of equal nature. The pin thus fitted into the bore will hold there very securely. So it is with the smooth surface of the caps of the wood gripping device, in Fig. 3. It will be noticed that there is a margin of space between the surfaces of the pieces at the juncture secured by the bolts, which space permits the pressure to exert itself wholly upon the pipe. On the other hand, if the bore in the gripping box is made too large, the pipe wall will not receive the needed frictional contact at *D*, Fig. 4, and the pipe will slip.

To remedy, simply remove some of the material from the box sides where the flat surfaces meet, so as to allow the bolts to bring the sides down tighter upon the pipe wall. A good form of gripping device, with 4 adjusting nuts on each side, using double bolts, is shown in Fig. 5, with the pressure spent upon the pipe wall at *E*.

Another view of one of the wooden gripping affairs is shown bolted in position on a pipe in Fig. 6. The manner of employing one of the bolted blocks in connection with a pipe and vise is shown in Fig. 7. There are occasions upon which the frictional contacting properties of one iron surface upon another are used with light half-wheels adjusted to a pipe employed as a shaft. Heavy work cannot be done with a hollow axle of the pipe-wall character. There are, of course, hollow steel shafts and axles, but in this case we refer to the common wrought iron pipe when used for retaining revolving pulleys in mechanical employment, as in Fig. 8. It is quite possible to clamp the two sides of the wheel to the pipe, as shown. The powerful gripping factors of the pulley thus applied prevent the pulley from slipping under ordinary circumstances.

You can get a good idea of the frictional contacting power of something bound about a pipe by winding a rope about the same, as in Fig. 9; or a piece of tin can be thus placed to demonstrate the frictional properties of two adjoining surfaces. If the pipe is of such nature that the walls will allow turning down with a shoulder, as in

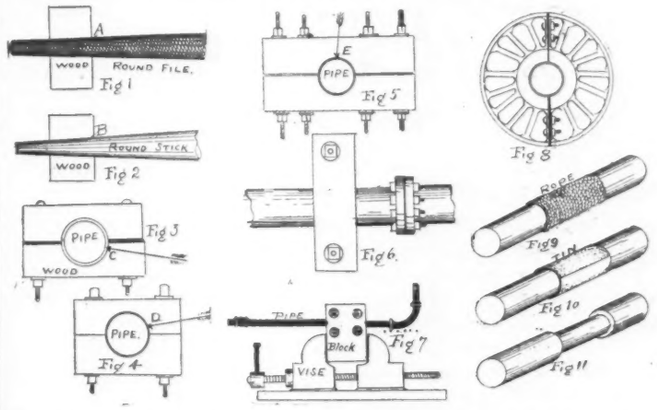


Fig. 11, the opportunity for placing frictional contacting surface. thereto is improved.

Meeting Times of the Various Gas Associations.

American Gas Institute.—Annual meeting, October, 1910. Atlantic City, N. J. Officers: President, Wm. H. Bradley, N. Y., City; Secretary, A. B. Beadle, 29 West 39th street, N. Y. City.

Canadian Gas Association.—Annual meeting, June, 1909. Hamilton, Ont. Officers: President, J. S. Norris, Montreal, P. Q.; Secretary and Treasurer, A. W. Moore Woodstock, Ont.

Empire State Gas and Electric Association.—Annual meeting, Nov., 1910. New York City. Officers: President, C. R. Huntley, Buffalo, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street. New York City.

Guild of Gas Managers of New England.—Annual meeting, December. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, A. K. Quinn; Newport, R. I.; Secretary, Walter G. Africa, Manchester, N. H.

Illinois Gas Association.—Annual meeting, time, March 18, 1910, Chicago, Ills. Officers: President, E. G. Schmidt, Springfield, Ills.; Secretary-Treasurer, C. B. Strohn, Elgin, Ills.

Illuminating Engineering Society.—Annual meeting, January 14, 1910. Meetings of Sections, monthly. President, W. H. Gartley, Philadelphia, Pa.; Secretary, Preston S. Millar, 29 W. 39th street, N. Y. City. Sections: New York: Secretary, Albert J. Marshall, 227 Fulton street. New England, Secretary, L. D. Gibbs, 39 Boylston street, Boston, Mass. Philadelphia, Secretary, F. N. Morton, Broad and Arch streets. Chicago, Secretary, T. R. Beebe, 157 Michigan avenue,

Indiana Gas Association.—Annual meeting, January 19, 1910, Indianapolis, Ind. Officers: President, J. W. Dunbar, New Albany, Ind.; Secretary-Treasurer, Philmer Eves, Indianapolis Gas Company, Indianapolis, Ind.

Iowa District Gas Association.—Annual meeting, time, June 23, 24, 25, 1910, Sioux City, Ia. Officers: President, Geo. H. Waring, Omaha, Neb.; Secretary and Treasurer, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, time, ———— Wichita, Kas. Officers: President, W. A. Scothorn, Hutchinson, Kas.; Secretary and Treasurer, J. D. Nicholson, Newton, Kas.

Michigan Gas Association.—Annual meeting, time, September, 1910; ———— Officers: President, B. O. Tippy, Grand Rapids, Mich.; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April 14, 15 and 16, 1910; Jefferson City, Mo. Officers: President, W. A. Bixby; Secretary and Treasurer, C. L. Clary, Sikeston, Mo.

National Commercial Gas Association.—Annual meeting, Dec. 14-22, 1909; New York, Officers: President, J. D. Shattuck, Chester, Pa.; Secretary-Treasurer, Lucius S. Bigelow, 106 Fulton street, New York City.

Natural Gas Association.—Annual meeting, May 17, 18 and 19, 1910; Oklahoma City, Okla. Officers: President, William H. McKenzie, Kansas City, Kas.; Secretary, T. C. Jones, Delaware, O.

New England Gas Association.—Annual meeting, third Wednesday in February; Boston. Officers: President, Walter G. Africa, Manchester, N. H.: Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

Oklahoma Electric Light, Railway and Gas Association.—Annual meeting, May 18, 19 and 20, 1910; Oklahoma City. Officers: President, F. H. Tidman, Oklahoma City, Okla.; Secretary-Treasurer, Galen Crow, Guthrie, Okla.

Pacific Coast Gas Association.—Annual meeting, ————, 1910, Los Angeles, Ca. Officers: President, W. B. Cline, Los Angeles, Cal.; Secretary-Treasurer, John A. Britton, 925 Franklin street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, April 13, 1910, Easton, Pa. Officers: President, E. G. Holzer, Easton, Pa.: Secretary-Treasurer, William H. Merritt, Lebanon, Pa.

Society of Gas Lighting.—Annual meeting, Dec. 9, 1909; monthly meeting, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 1123 Broadway, New York.

Southern Gas Association.—Annual meeting, Feb. 16, 1910, Chattanooga, Tenn. Officers: President, R. C. Congdon, Atlanta, Ga.; Secretary-Treasurer, James Ferrier, Rome, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. ————, 1910, Beaumont, Tex. Officers: President, R. B. Stichter, Dallas, Tex.; Secretary's office, 300 Commerce street, Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May 11 and 12, 1910, Milwaukee, Wis. Officers: President, R. B. Brown, Milwaukee, Wis.; Secretary-Treasurer, H H. Hyde, Racine, Wis.

Items of Interest
FROM VARIOUS LOCALITIES.

A CORRESPONDENT in Chicago, writing under date of the 1st inst., has this to say respecting the more than odd course taken by the residents of Marshaltown, Ia., in respect of the proposition for a better gas supply to that city:

"As you are possibly aware, the authorities of Marshalltown, Ia., have been considering the advisability of preparing and issuing suitable ordinances to certain responsible and representative capitalists and business men, formed into a company for the purpose of purchasing and taking over from the present owners (Messrs. Jones and Hovey) the local gas, electric lighting and street railway properties of Marshalltown. The ordinances finally agreed upon, which were satisfactory to the Mayor and the City Council, and, in fact, received the stamp of their approval, were fair, reasonable and progressive in every respect. It could, in fact, hardly be otherwise, in that the agreements contemplated a complete rehabilitation of the properties, to the end that the residents there could be given a service first-class in every respect. And right here candor impels the admission that the Jones-Hovey Company had neglected to do much that might have been done to the betterment of the service and the convenience of the people. I should also note that the rates specified, on gas and electric sales' account, were more than reasonable; in fact, the basic scale of these would answer well in a city much larger than the one under consideration. Notwithstanding these favorable conditions, the ordinances, when put before the voters, were defeated by a majority which rather indicated that the voters did not care for any different service or lower rates than those which hitherto obtained. The main trouble, however, was evidently that the ordinances were voted upon at a time of fierce political scrapping, in which duello everything that even savored of pertaining to the administration went down to defeat. I feel perfectly safe in saying that the residents have missed an opportunity to be advantaged manifold by the reconstructing of their public utilities systems. Surely it is that those who aimed to succeed the Jones-Hovey combination, were treated shabbily, a treatment that those concerned in the administering thereof will not likely soon forget."

THE plans for bettering the physical condition of the Jeffersonville, Ind., plant of the United Gas and Electric Company, provide for an expenditure not far off $35,000. A new holder is included in the list.

On the afternoon of the 26th ult. all the property and franchises of the Muncie (Ind.) Gas, Light and Fuel Company were sold at public sale, at the instance of an order served on Mr. Edward Daniels, who acted as Master in Chancery. The purchaser was nominally the Harris Trust and Savings Bank, acting through Mr. Robert O. Lord. It is said that the plan to properly equip the plant for the manufacture and distribution of coal gas will be gone on with at once.

MR. GEORGE STUART, formerly connected with the Elgin (Ills.) Gas Company, has been appointed agent of the Woodstock (Ills.) branch of the Copley gas properties.

MISS M. MCCLINTIC, at the instance of the Lincoln (Ills.) Gas Company, the first week of current month, held a series of demonstration lectures on the "Science of Domestic Economy," that were exceedingly well attended. One thing that was brought off in connection with this series, and which did not look quite in keeping with altogether unbiased work, was the protruding fact (in both "ads." and speech) that the lecturer always used a certain brand of baking powder during the process of batch making. Better leave something to the imagination of the visitors; at least so it seems to us.

ONE course which enabled Manager Walter T. Soper and his associates in the direction of the Taunton (Mass.) Gas Light Company to reach the dollar selling mark (effective January 1st) was the judicious plan of main extension carried out since 1904. In that time the main service had been added to in the sum of 26 miles, one line of which—that crossing the river into the North Dighton territory—has proved very profitable.

"J. A. J.," writing under date of December 4th, informs us that the new gas plant for Parkesburg, Pa., was satisfactorily put into operation the evening of the 30th ult. Manager Cattell, even at this early time of the trial, is being importuned to pipe certain contiguous settlements, but those will have to wait until the Parkesburg lines proper are all safely buried.

A BELATED item concerns the annual meeting of the Mansfield Gas Light Company and of the Mansfield Electric Light and Power Company. The Directors chosen in the first named were: Joseph Hedges, W. C. Hedges, C. W. Upson, J. S. Hedges, H. M. Weaver, J. P. Seward and J. E. Upson. In the latter: C. W. Upson, C. N. Gaumer, W. C. Hedges, E. H. Keiser, J. E. Upson, N. B. Bushnell and J. S. Hedges The joint Board named the following executive management: President, C. W. Upson; Vice-President, J. S. Hedges; Treasurer, J. E. Upson; Secy. and Supt., W. C. Hedges.

MR. O. L. NICHOLSON, has recently been appointed General Sales' Manager of the Westinghouse Electric and Manufacturing Company, with direct charge over the sales' policies of the entire Company. Mr. Nicholson has been with the Westinghouse concern since 1888, either as salesman, district department manager, and as Industrial and Power Sales' Manager for the past 5 years. Before joining the Westinghouse forces he was with the C. & C. Electric; but perhaps his best known connection was as organizer and President of the American Association of Motor Manufacturers, which organization has done much creditable work, and all since 1907, to improve the art of motor manufacturing.

"V. R. S." is informed that in the franchise agreement, under which the Town Board of Lindenhurst, L. I., granted Hiram Allen Odell, of New York city, and associates, the right to supply gas to the residents for a term of 25 years, it is stipulated: "That the gross rate shall not exceed $1.60, net $1.50; after 5 years from time the supply is laid on, the Company is to pay the authorities $100 per annum for 5 years, the sum thereafter to be $150 per annum. It is also stipulated that the Company will light free all fire houses now in use, or that may be erected during the life of the franchise." The latter provision may not fairly be termed an onerous one. It is also directed that the plant shall be in operation within 17 months after the signing of the franchise. The same parties have the right to operate gas plants, in Babylon to the east, and in Amityville to the west, of the Lindenhurst settlement.

THOSE who think that "Gov." S. F. Hayward is no longer able to indite a circular that breathes of poetic license and that fairly glows in its output of hope abiding belief should write to him, at his eyrie in the Hudson Terminal Building for a copy of his "last." It surely is illuminated with the brightest of hopes, expressive of the glows of the harvest time.

IN the reckoning over back accounts, between the City of New York and the Consolidated Gas Company, it is found that the city owes the Company some sum over $1,000,000. The city has not paid the Company a cent for gas and electric currents supplied it since early in 1903; on the other hand, the Company has not paid anything on account of franchise taxation under the changed laws. The debt of the city to the Company is something in excess of $11,000,000; the debt of the Company to the city is something in excess of $10,000,000. Meanwhile each goes on trusting the other without much speech as to the possible intervention of the Sheriff.

THE new net rate of 90 cents per 1,000 cubic feet ($1 gross) at Atlantic City, N. J., has been accepted by the gas users there as a reasonable one. The main offices of the Atlantic City Gas and Water Company have been removed to the premises formerly occupied by the Consumers Gas Company, on Atlantic, above Kentucky avenues.

The general management of the consolidated enterprise will be in the care of Mr. Carlton Geist, Mr. Tompkins likely remaining as Superintendent. The new selling rate also applies to the Margate City and Longport districts.

A CORRESPONDENT inclosed the following under date of the 4th inst.: "The Pittsfield (Mass.) Coal Gas Company, to meet the requests of the Pittsfield Aero Club, and Aero Club of America, respectively, has constructed a large balloon shed, up to storing 10 balloons of large size; also, a tent in which to carry out repairs to the aerial travellers. The Company will also construct a storage holder for balloon gas, the retaining capacity of which will be 250,000 cubic feet. This provision will be maintained at all times throughout the season.

THE new ordinance regulating gas rates in Alexandria, Va., became effective the 1st inst. The gross is $1.30 per 1,000 cubic feet; net, $1.

THE following pronouncement was made from the home office of the U. G. I. Company, the morning of the 4th inst.:

"*Resolved*, That it is the judgment of the Board of Directors of the United Gas Improvement Company that a special dividend of 10 per cent., payable in non-interest bearing scrip, convertible at par into the stock of the Company at par, shall be declared, provided the stockholders consent, in due form of law, to an increase of the capital stock for the purpose." The special meeting to accept or reject the proposition is called for February 9th, and the dividend will be payable April 1, 1910.

"MR. RICHARD MILLER, Superintendent of the municipal gas plant at Wheeling, W. Va., is to be congratulated over his masterful manner of handling the strike amongst the stokers of that plant recently," so writes "T. M. L.," under date of the 5th inst. Continuing, our correspondent states: "The cause was altogether too unreasonable at the outset, and briefly stated, the case was this: The change in the system was made after due consideration by Supt. Miller—who, it can be truthfully said, is not in any sense a slave driver. Under the prior schedule charges of 225 pounds of coal were made each 4 hours, under the reformed way the 270 pounds were charged each period of 4 hours, 48 minutes, and only 20 retorts were pulled instead of 24, as formerly; 2 stokers, 1 charger and 1 mudder being assigned to each bench. Under this plan no greater weight of coal was handled by the men, because, while the weight of the charges was increased, the number of pulls was cut down. Under the new system of burning off, Mr. Miller counts on producing at least 25 cubic feet of gas in excess of the old way as to the baking of each 100 pounds of coal under the prior system. As an average of 101,000 pounds of coal is now being used each 24 hours, the saving effected by the new carbonizing system will not be far from $20 per day."

AT a special meeting of the Anderson (S. C.) Council, held early this month, a franchise for the operation of a gas works there was passed to Mr. Arthur Medwedoff and associates, of Chicago. Work on the plant must be commenced within 6 months and the plant must be in operation within 12 months from the time the franchise is accepted. Failure to live up to these provisions will cause the forfeiture of $500 in cash, deposited by the syndicate with the City Treasurer, as a guarantee of good faith.

NEGOTIATIONS for a change in ownership of the Jackson (Miss.) Electric Railway, Light and Power Company, and the Jackson Gas Light Company, are underway. Mr. H. H. Corson, General Agent of the General Electric Company, is prominent in the negotiations.

THE proprietors of the Newton and Watertown (Mass.) Gas Light Company have petitioned the Board of Gas and Electric Light Commissioners for the right to issue 2,000 shares of new stock, "to cover outstanding indebtedness and to acquire additional property."

THROUGH acquiring the holdings of Farson, Son & Co., A. B. Leach & Co., and several other scattering lots, the Doherty syndicate has taken on about 95 per cent. of the stock issued by the Knoxville (Tenn.) Gas Company.

THE net earnings of the Companies in the Geist combination for the month of last October, as compared with those of the corresponding month of 1908, show a gain equal to 15.4 per cent.

THE entertainment and reception by the Gas Companies Employees' Mutual Aid Society, of New York, given at the Lexington Avenue Opera House the night of the 3d inst., was really a notable affair. Prominent in the attendance were President Cortelyou of the Consolidated Company, Vice-President Addicks, Chief Bradley and others of the staff. Up to the present time this organization has expended $126,062 in benefits, close to $1 00,000 of which was paid out on life insurance or benefit account. One-half of the total sum named may be credited to contributions to the fund by the Consolidated Company.

THE Key City Gas Company, of Dubuque, Ia., starts the subscription list that has been authorized and arranged to receive funds necessary for the promotion of the plan to boom a "Greater Dubuque." The Company pledges itself in the sum of $2,000.

MR. H. W. DARLING, of Chicago, will assume the management of the Lansing (Mich.) plant about February 1st.

PUBLIC LIGHTING TABLE.

DECEMBER, 1909.

Table No. 1.
FOLLOWING THE MOON.

Day of Week.	Date.	Light.	Extinguish.
Wed.	1	5 10PM	9.50PM
Thu.	2	5.10	11.00
Fri.	3	5.10	12.00
Sat.	4	5.10LQ	1.00AM
Sun.	5	5.00	2.00
Mon.	6	5.00	3.00
Tue.	7	5.00	3.50
Wed.	8	5.00	4.50
Thu.	9	5.00	6.10
Fri.	10	5.00	6.10
Sat.	11	5.00	6.10
Sun.	12	5.00NM	6.10
Mon.	13	5.00	6.10
Tue.	14	5.00	6.10
Wed.	15	5.00	6.10
Thu.	16	5.00	6.10
Fri.	17	8.30	6.10
Sat.	18	9.40	6.10
Sun.	19	10.50FQ	6.20
Mon.	20	11.10	6.20
Tue.	21	1.20AM	6.20
Wed.	22	2.30	6.20
Thu.	23	3.50	6.20
Fri.	24	5.00	6.20
Sat.	25	No L.	No L.
Sun.	26	No L.FM	No L.
Mon.	27	No L.	No L.
Tue.	28	5.10PM	7.30PM
Wed.	29	5.10	8.40
Thu.	30	5.10	9.40
Fri.	31	5.10	10.50

TOTAL HOURS DURING 1909.

By Table No. 1.

	Hrs.Min.
January	212.20
February	183.40
March	173.00
April	151.10
May	144.10
June	138.50
July	145.40
August	160.30
September	180.00
October	201.00
November	216.30
December	233.40
Total, yr.	2140.30

PUBLIC LIGHTING TABLE.

DECEMBER, 1909.

Table No. 2.
NEW YORK CITY.
ALL NIGHT LIGHTING.

Day of Week.	Date.	Complete Lighting in One Hour	Complete Extinguishing in 50 Minutes
		From Time Given	
		P. M.	A. M.
Wed.	1	4.07	5.52
Thu.	2	4.07	5.52
Fri.	3	4.02	5.57
Sat.	4	4.02	5.57
Sun.	5	4.02	5.57
Mon.	6	4.02	5.57
Tue.	7	4.02	5.57
Wed.	8	4.02	5.57
Thu.	9	4.02	5.57
Fri.	10	3.57	6.07
Sat.	11	3.57	6.07
Sun.	12	3.57	6.07
Mon.	13	3.57	6.07
Tue.	14	3.57	6.07
Wed.	15	3.57	6.07
Thu.	16	3.57	6.07
Fri.	17	3.57	6.17
Sat.	18	3.57	6.17
Sun.	19	3.57	6.17
Mon.	20	3.57	6.17
Tue.	21	3.57	6.17
Wed.	22	3.57	6.17
Thu.	23	3.57	6.17
Fri.	24	4.02	6.22
Sat.	25	4.02	6.22
Sun.	26	4.07	6.22
Mon.	27	4.07	6.22
Tue.	28	4.07	6.22
Wed.	29	4.07	6.22
Thu.	30	4.07	6.22
Fri.	31	4.12	6.27

TOTAL HOURS DURING 1909.

	Hrs.Min.
January	428.30
February	358.15
March	353.10
April	298.10
May	263.20
June	234.45
July	248.30
August	278.00
September	311.25
October	370.05
November	397.40
December	438.35
	3980.25
Deduct on account of 50 min. extinguishing time	30.25
Total, yr.	3950.00

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

MONDAY, DECEMBER 13, 1909.

The Market for Gas Securities.

Consolidated again advanced sharply, going to 151¼ as the high point for the week. The opening to-day (Friday) was 151 to 151½. The Company was never in better (if as good) physical condition as it is at present. In fact, every indication makes for strength.

Brooklyn Union is steady with quite some inquiry for its bonds, which are up 4 points. Peoples, of Chicago, is another brand that looks well. It is 114½ bid, and that figure is 10 points under its fair speculative value. As an investment security, it would look cheap to us at 130. The special meeting of the U. G. I. Company to consider the matter of an issue of convertible scrip, amounting to 10 per cent. on the outstanding capital, is set for February 9th. The H. M. Byllesby Company announces a quarterly dividend of 1¼ per cent. on the common stock of the Oklahoma Gas and Electric Company, payable the 15th inst., also 1¼ per cent. on the common of the San Diego Consol. Gas and Electric Company. The bond market continues its recent activity.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

DECEMBER 13.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$78,177,000	100	151	151¼
Central Union Gas Co. — 1st 5's, due 1972, J. & J.	3,000,000	1,000	98	101
Equitable Gas Light Co.— Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual Gas Co.	2,500,000	100	155	165
New Amsterdam Gas Co.— 1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	100	101½
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	100	101
New York and East River— 1st 5's, due 1944, J. & J.	3,500,000	1,000	104	107
Con. 5's, due 1945, J. & J.	1,500,000	—	97	101
Northern Union— 1st 5's, due 1927, J. & J.	1,250,000	1,000	94	100
Standard	5,000,000	100	—	75
Preferred	5,000,000	100	70	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	143¼	145
1st Con. 5's, due 1948, M. & N.	15,000,000	—	95	99
Yonkers	999,650	500	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	1	1½
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	500,000	1,000	90	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	73	73¼
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,000,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	29,500,000	100	92	93
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt & Heating Co.	1,682,750	100	90¼	91
Preferred	3,026,500	100	75¼	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	—	105
Mortgages, 6's	3,600,000	—	—	118
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	458,000	—	102	105
Detroit City Gas Co	5,000,000	50	—	50
" Prior Lien 5's	4,619,000	1,000	97	100½
Detroit Gas Co., 5's	381,000	1,000	75	80
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	112	113½
" Bonds, 5's	10,500,000	—	108	108½
Indianapolis	2,000,000	—	60	70
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	200,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis.	10,000,000	100	104	105
Preferred	2,500,000	100	—	98
Bonds	10,000,000	1,000	104	—
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	350,000	1,000	106	108½
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies, of Boston	25,000,000	100	78	78¼
Preferred	25,000,000	100	91½	92
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	6,000,000	—	137	138
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	114½	114¾
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104½	105½
San Francisco Gas Co., Cal.	15,500,000	—	—	—
St. Joseph Gas Co.— 1st Mtg. 5's	751,000	1,000	100	102
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgages, 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	90	95
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	100	104
Washington (D. C.) Gas Co.	600,000	20	350	352½
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	230	—

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Western Gas Construction Co., Fort Wayne, Ind.....1288

(*Continued on page* 1306.)

SPECIAL MEETING.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, December 9, 1909.

A Special Meeting of the Stockholders of The United Gas Improvement Company will be held at the office of the Company, Northwest Corner of BROAD AND ARCH STREETS, PHILADELPHIA, on Wednesday, Feb. 9, 1910, at 12 o'clock, noon, for the purpose of acting upon the subject of a proposed increase in the authorized capital stock of the Company from 1,009,467 shares, of the par value of $50 each, to 1,110,414 shares, of the par value of $50 each.

By order of the Board of Directors.

W. F. DOUTHIRT, Secretary.

The stock transfer books will be closed from 3 P.M., Jan. 28, 1910, until 10 A.M., Feb. 10, 1910.

1-01-9

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., Dec. 8, 1909.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Jan. 15th, 1910, to stockholders of record at the close of business, Dec. 31, 1909. Checks will be mailed.

1801-5 LEWIS LILLIE, Treasurer.

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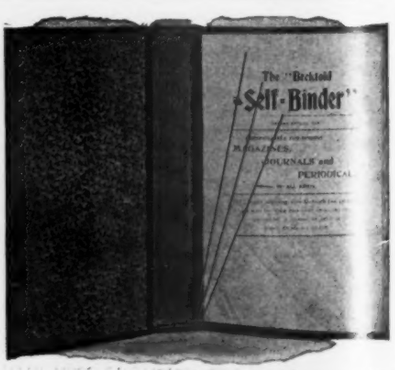

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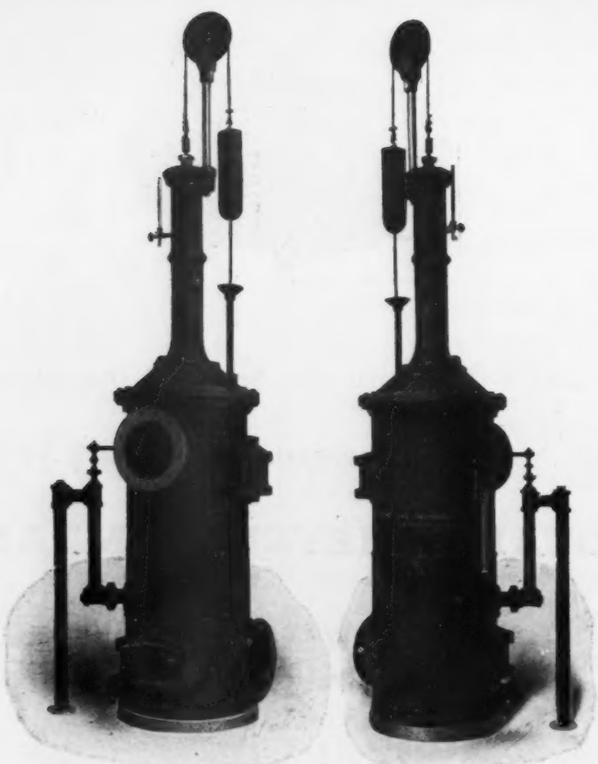

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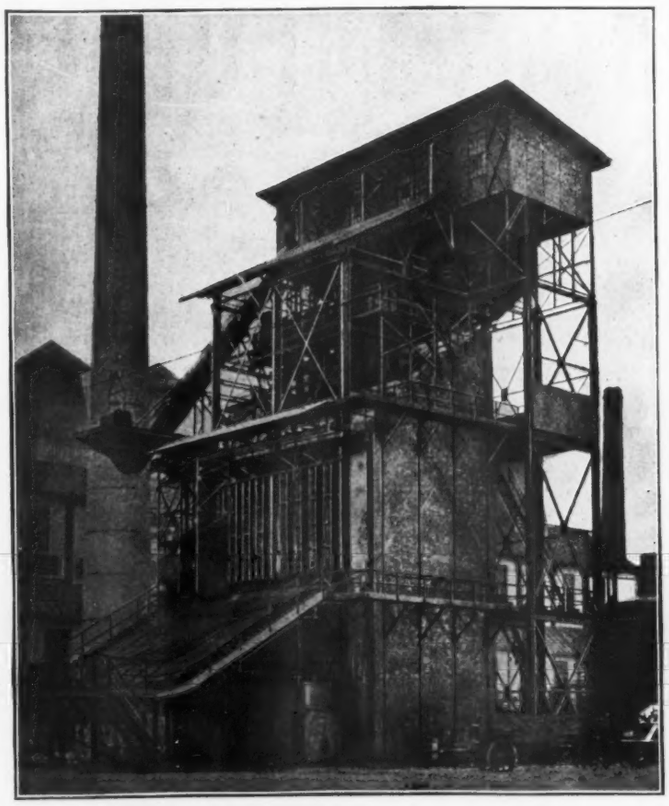

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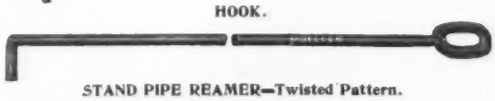

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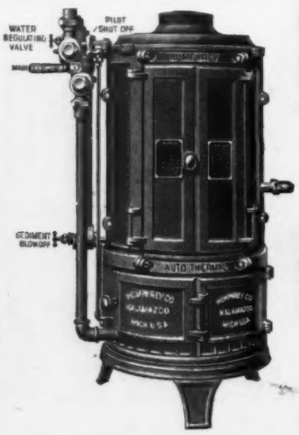

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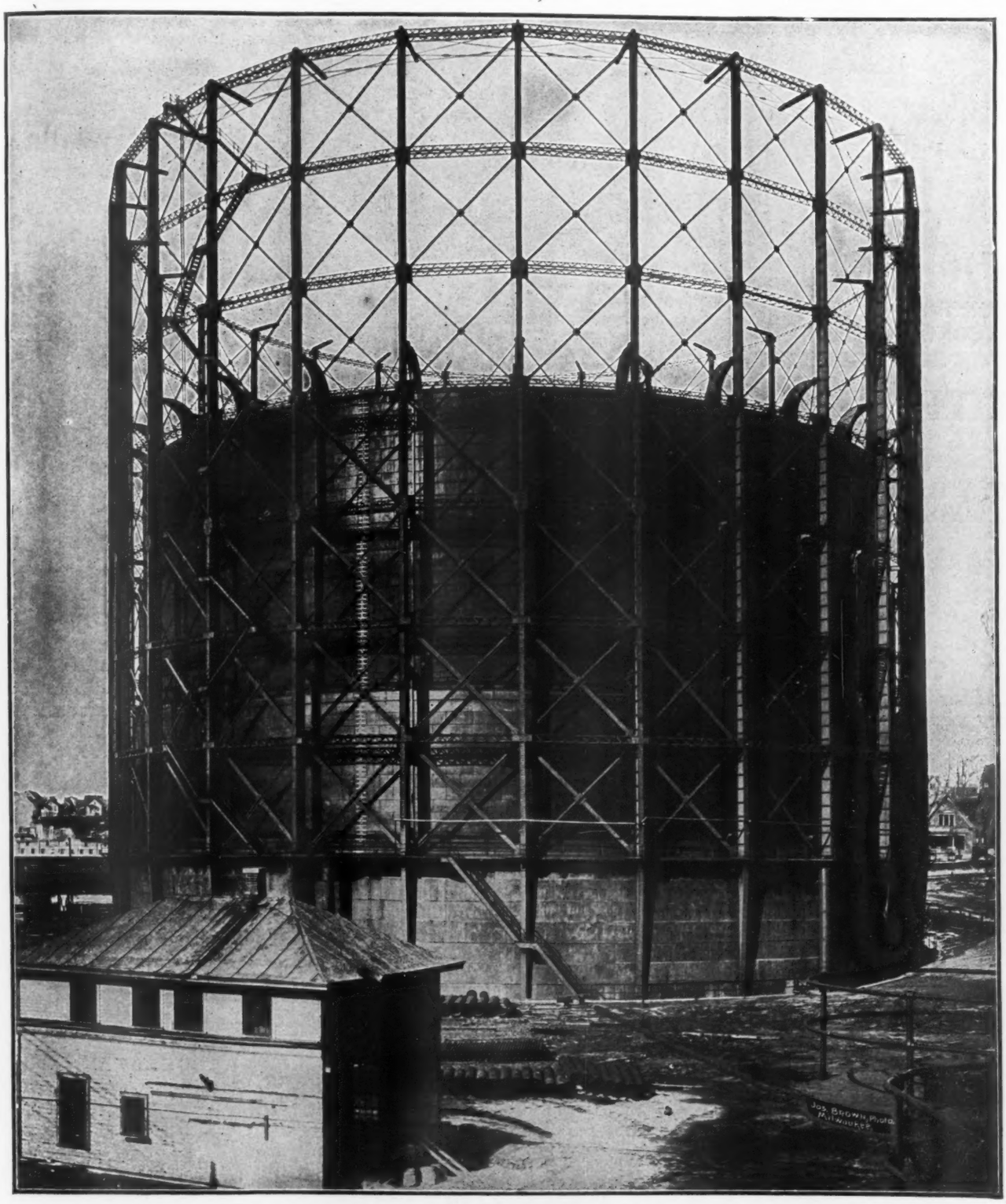

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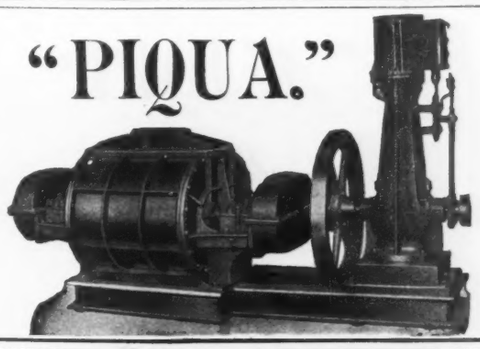

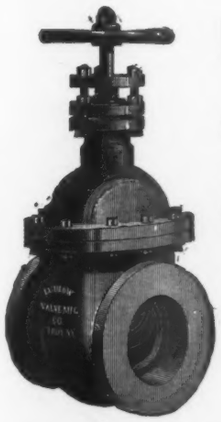

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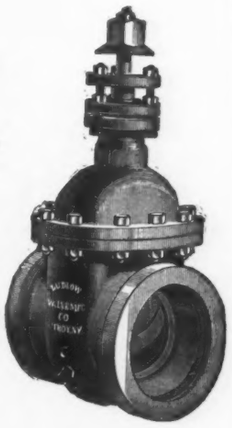

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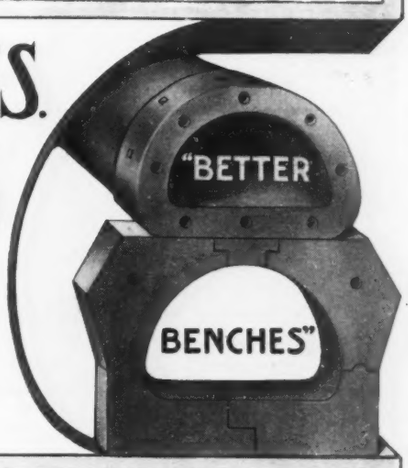

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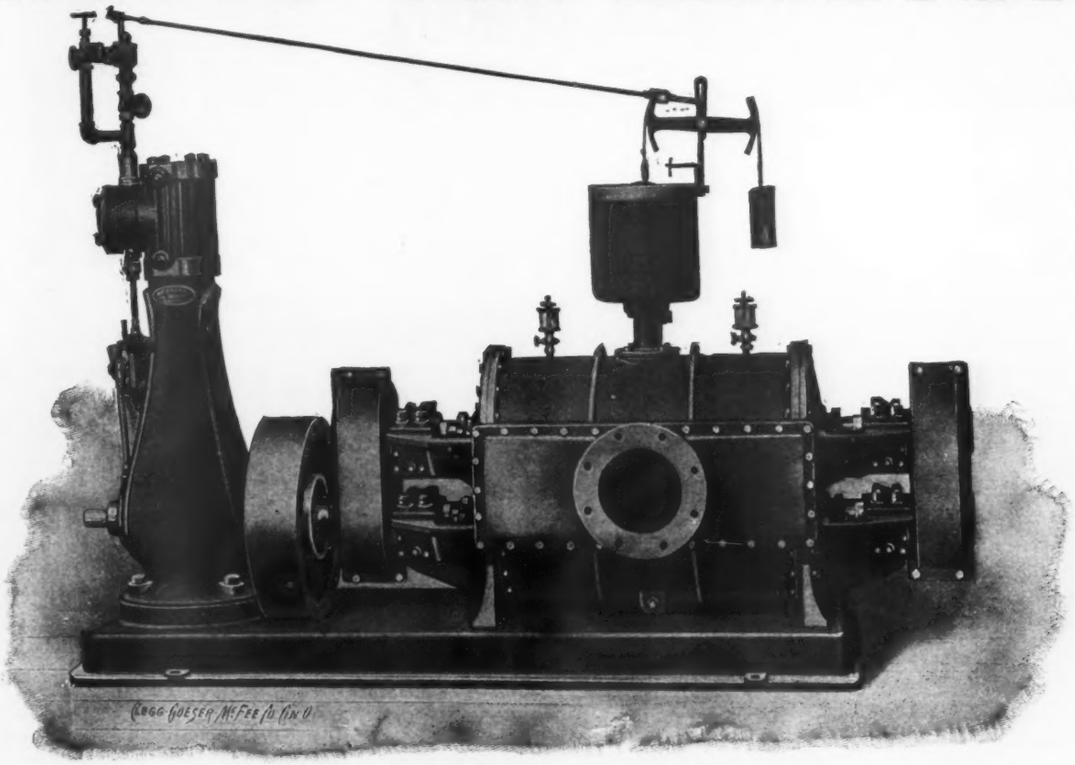

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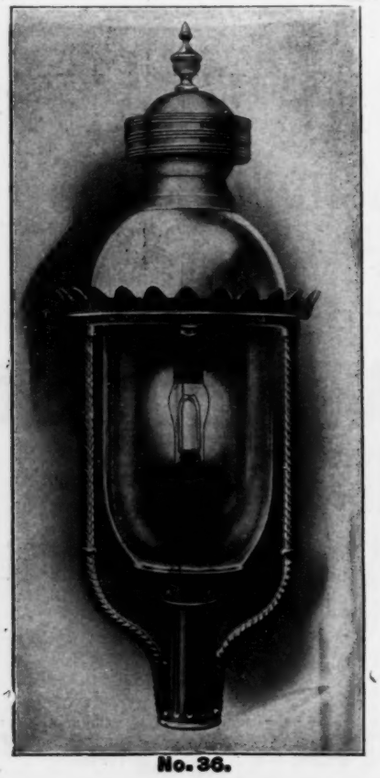

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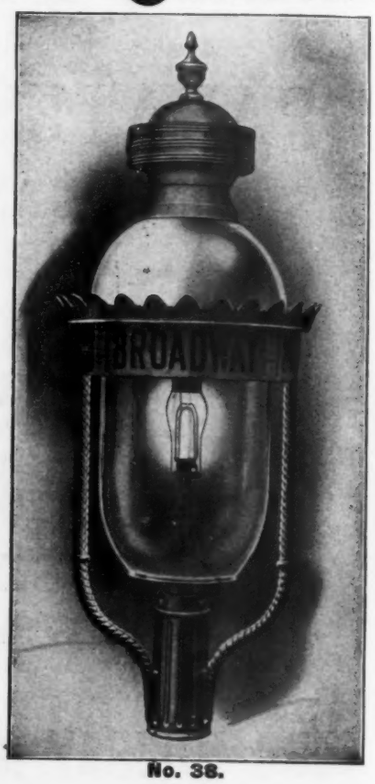

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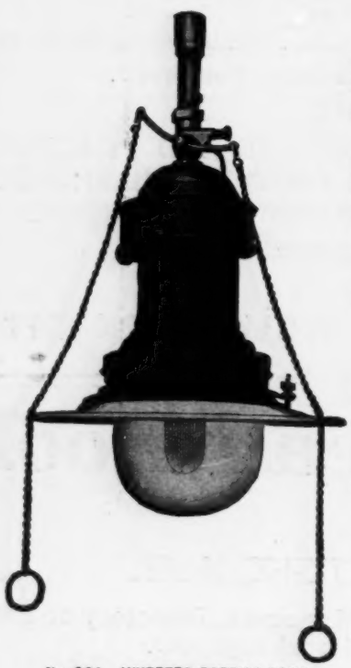

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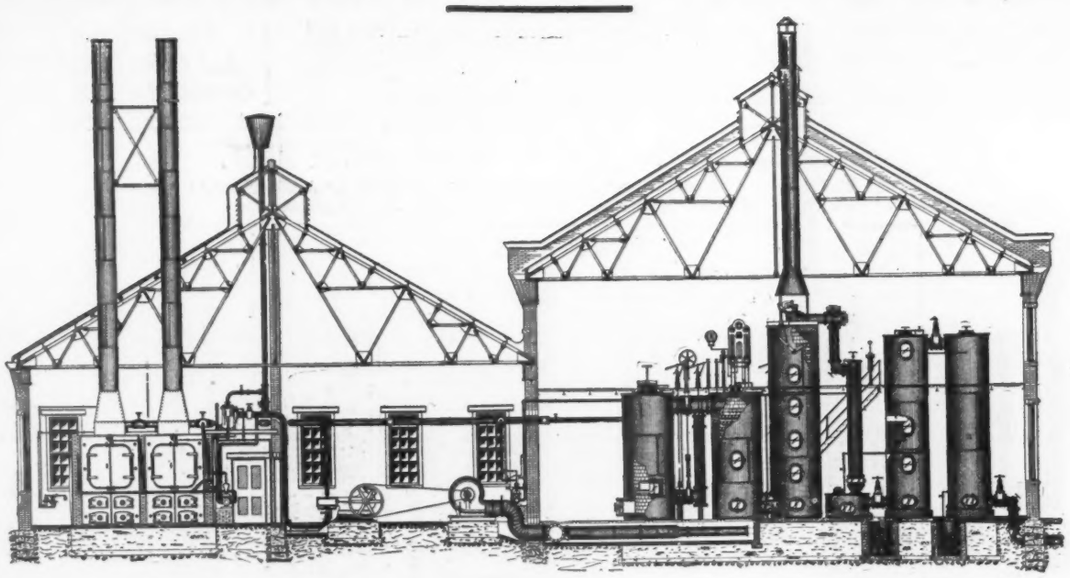

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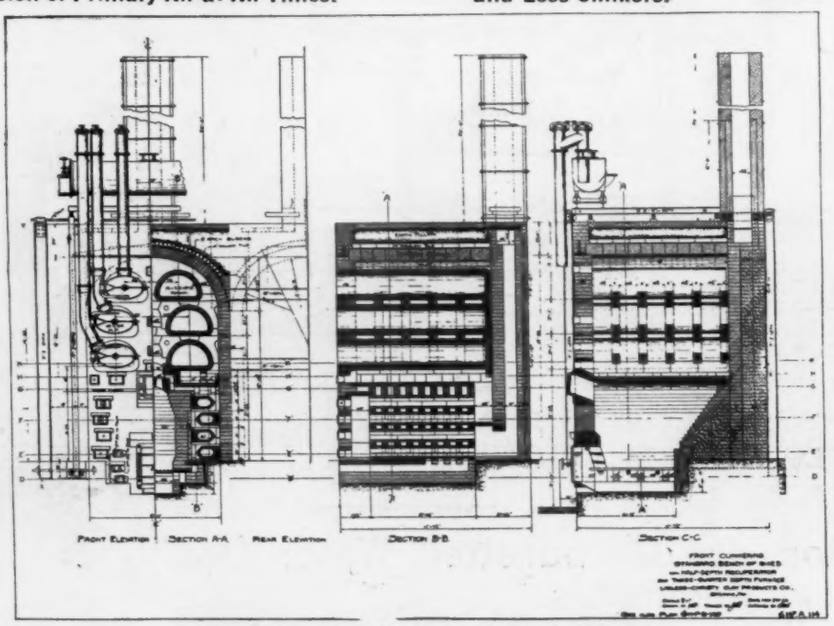

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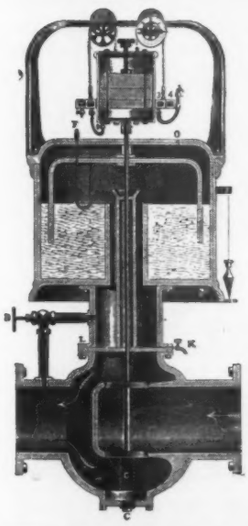

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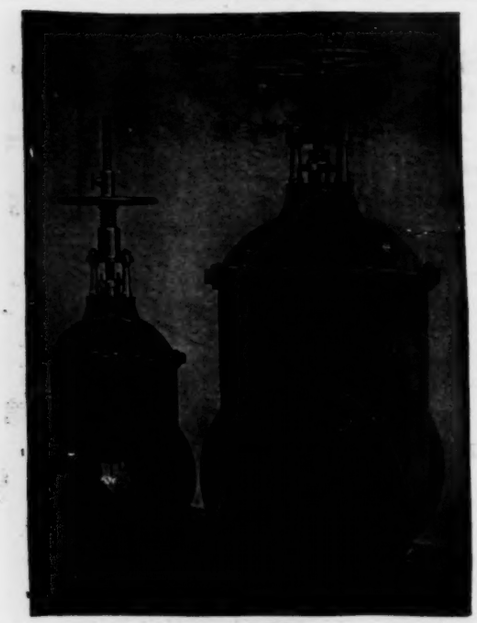

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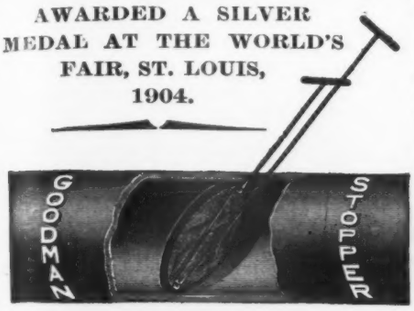

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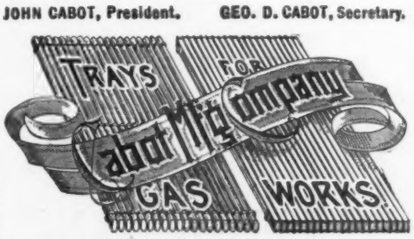

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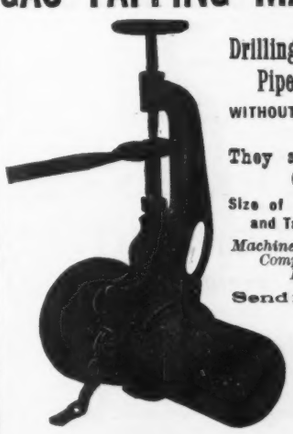

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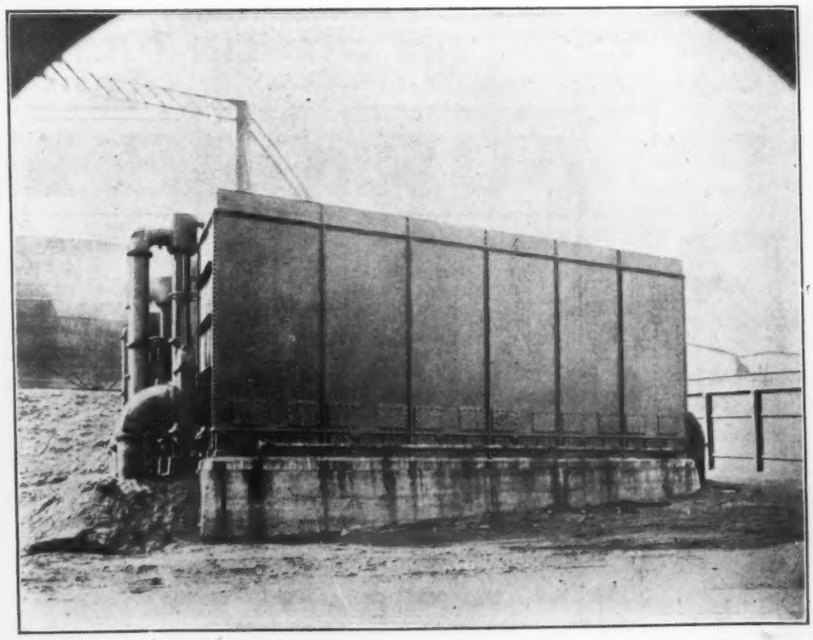

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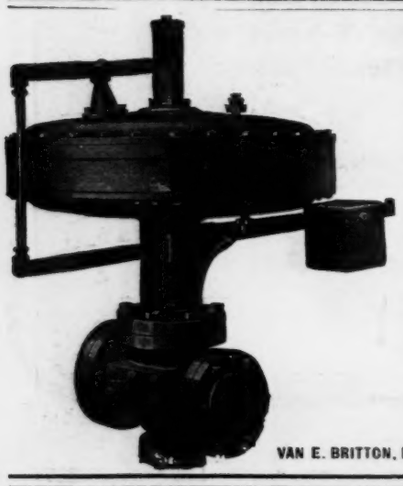

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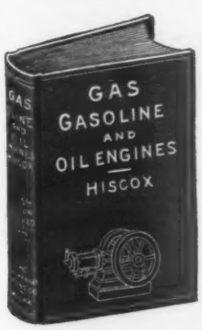

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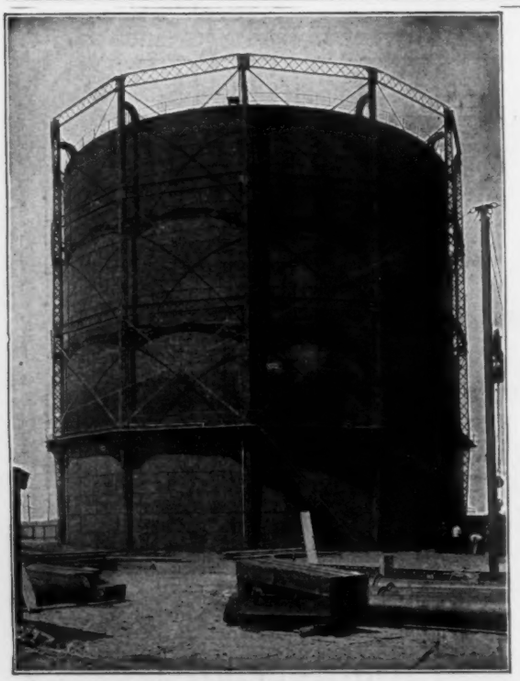

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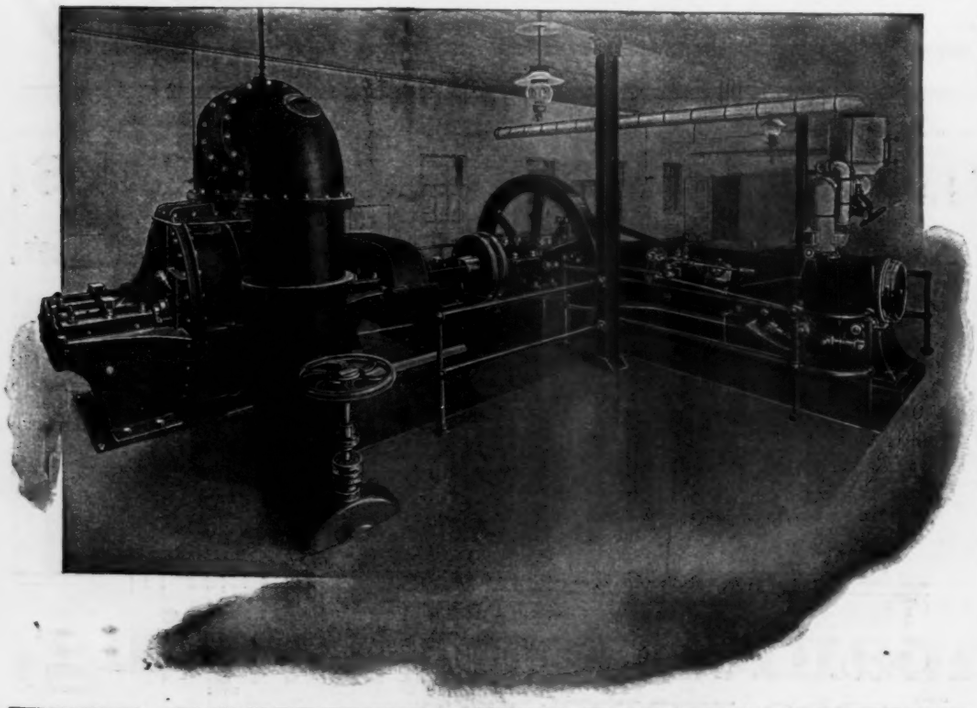

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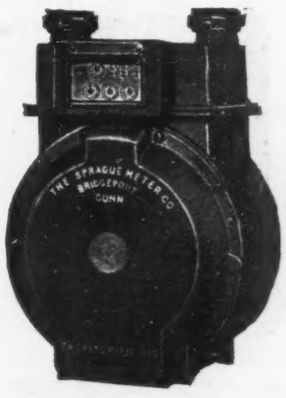

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